WATER WORKS & SEWERAGE

ATLANTA'S 54 MGD FILTER PLANT OF 1941

[AND ANOTHER CHAPTER TO 55 YEARS OF FILTRATION HISTORY.]

MORE than three-quarters of our current production is now being required for direct and indirect National Defense projects—camps, naval bases, airports, munitions plants, defense housing construction, et cetera. The large part which cast iron pressure pipe is playing in National Defense is a compliment, not only to its durability and economy, but to the judgment of water works, sewage works and gas engineers who prefer it above all other materials for underground main construction.

UNITED STATES PIPE & FOUNDRY CO., General Offices: Burlington, N. J.

Plants and Sales Offices throughout the U. S. A.

Lithographed on stone by Edward A. Wilson

U.S. cast iron PIPE

Centrifugally or Pit Cast for water works, gas, sewerage, drainage and industrial services.

We're in our 'teens, but—
we grew up almost overnight!

Yes sir, we had a healthy, normal plant growth for 'teen years, caused by industry's cordial acceptance of "3C" electrical control apparatus.

Then along came DEFENSE—and almost overnight we grew, and grew, and grew!

And did we have *"growing pains!"*

Even before windows were in place in our plant additions, new men, new machines, new devices, all blended with our standard production into a smooth-working schedule.

We don't make armament nor munitions, but we do make electrical control apparatus for use on motors and vital machines responsible for "all out" production.

Some difficulties? Sure, we have 'em —who hasn't?

Deliveries? We're making them—not as fast as we'd like—but who's doing any better?

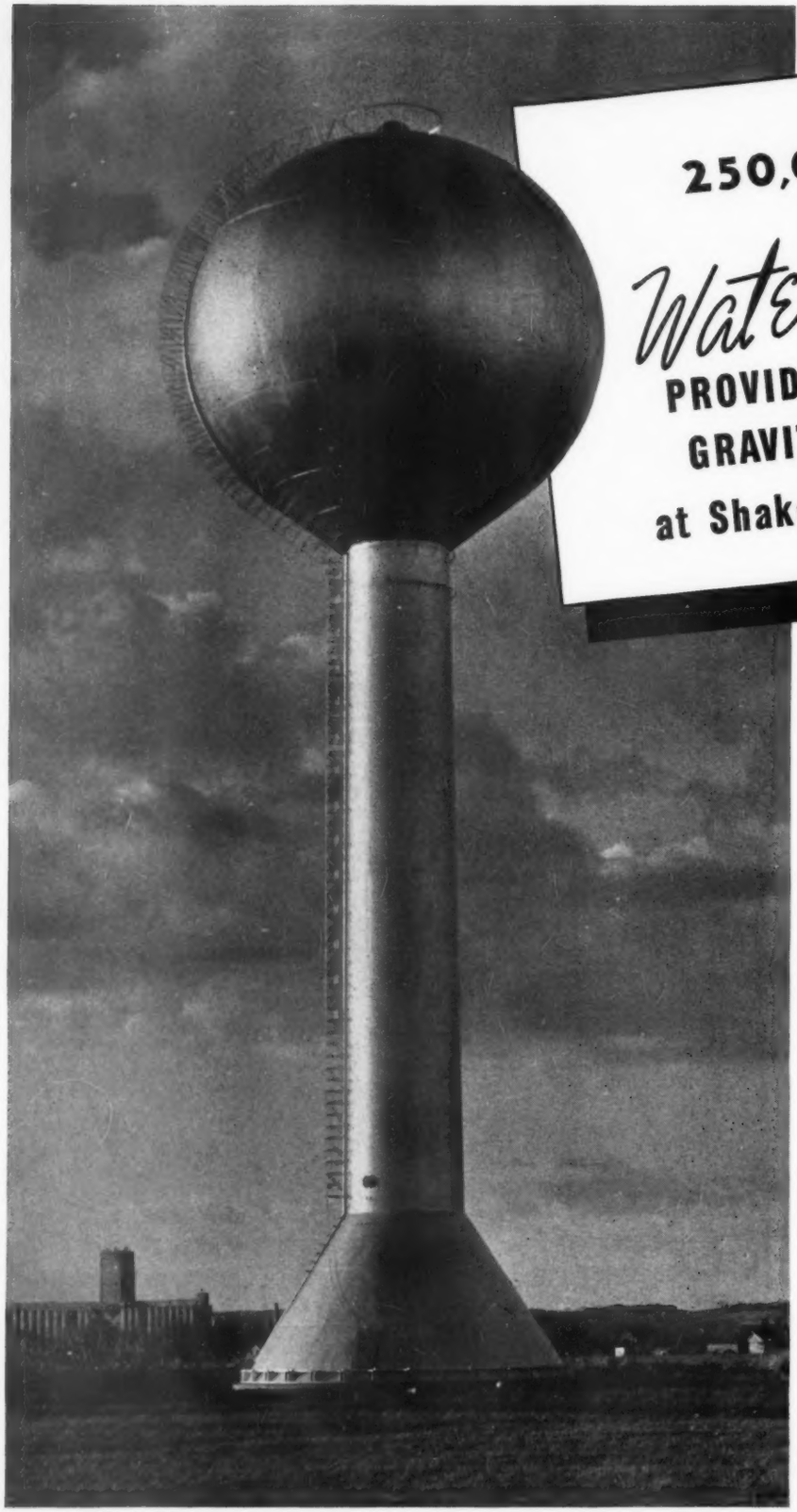
We're *"in there, pitchin' "*—just as anxious as ever to service your electrical control needs, and your requirements are being given just as careful attention as possible.

Our *"grown-up"* facilities are at your service.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO



250,000-GAL. *Watersphere* PROVIDES EFFICIENT GRAVITY PRESSURE at Shakopee, Minnesota

SHAKOPEE, a town of 2,500 population, lies about 20 miles southeast of Minneapolis. If you happened to be driving near this typical Minnesota community, probably the first landmark you'd notice would be the shining new Watersphere illustrated here, which is installed near the south end of the city limits. With its capacity of 250,000 gals., and a height of 90 ft. to bottom, this spherical design elevated water tower provides efficient gravity pressure to meet the requirements of 342 residential and 84 commercial water consumers. The water supply source for Shakopee is drawn from an artesian well by a deep-well turbine, and is required to provide for an average daily consumption of from 125,000 gals., in winter to 300,000 gals. in summer. The Watersphere rides on the system, helping to maintain uniform distribution pressures and to reduce the number of hours that the pump is required to operate for maximum efficiency.

CHICAGO BRIDGE & IRON COMPANY

Chicago	2198 McCormick Bldg.	Birmingham	1586 North 50th Street	Philadelphia	1644-1700 Walnut St.
New York	3390-165 Broadway Bldg.	Tulsa	1646 Hunt Bldg.	Boston	1548 Consolidated Gas Bldg.
Cleveland	2262 Builder's Exchange	Houston	5615 Clinton Drive	San Francisco	1083 Rialto Bldg.
Havana	402 Edificio Abreu	Detroit	1551 Lafayette Bldg.	Los Angeles	1455 Wm. Fox Bldg.

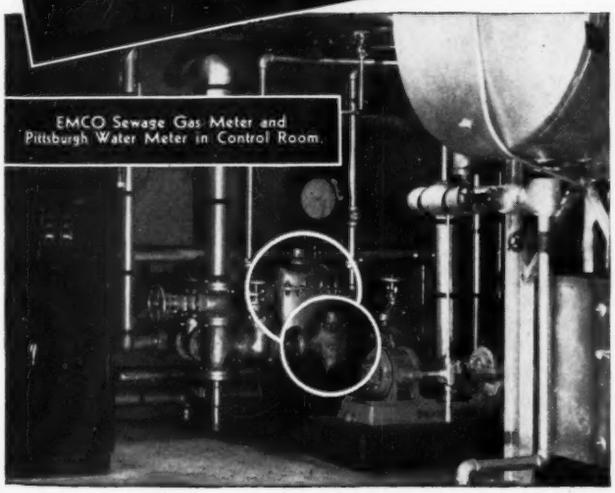
Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

WATER WORKS & SEWERAGE, October, 1941. Volume 88. Number 10. Published monthly at 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States $2.00 per year; Canada $2.40 per year; Foreign $3.00 per year. Copyright, 1941, by Gillette Publishing Co. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.

Everything's under Control

IN THE MARION, INDIANA SEWAGE TREATMENT PLANT

With
NORDSTROM Lubricated Plug Valves
EMCO Sewage Gas Meters
PITTSBURGH Water Meters



EMCO Sewage Gas Meter and Pittsburgh Water Meter in Control Room.

WITH the completion of the new Marion, Indiana, sewage disposal plant, another name has been added to the long list of users of EMCO Sewage Gas Meters, Nordstrom Lubricated Plug Valves and Pittsburgh Water Meters. Here is another instance where this accurate and dependable equipment has been installed.

Meter and valve services in sewage treatment plants are particularly severe, due to the highly corrosive and abrasive character of the substances handled. That's why Consulting Engineers are specifying especially constructed EMCO Gas Meters, Nordstrom Lubricated Plug Valves and Pittsburgh Water Meters. Foresight in installing the proper meter and valve for each service, prior to starting new construction, will more than be repaid later in freedom from operating difficulties, repairs and costly replacements.

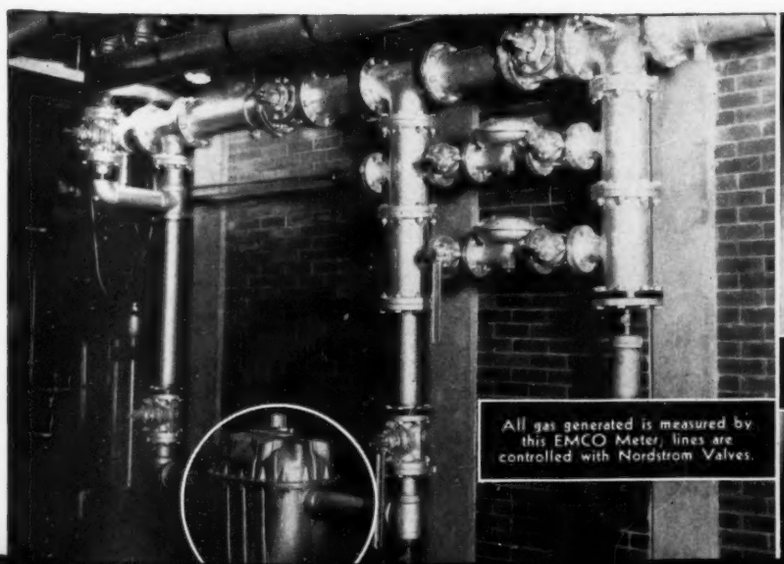
Write for bulletin giving complete information.

PITTSBURGH EQUITABLE METER COMPANY

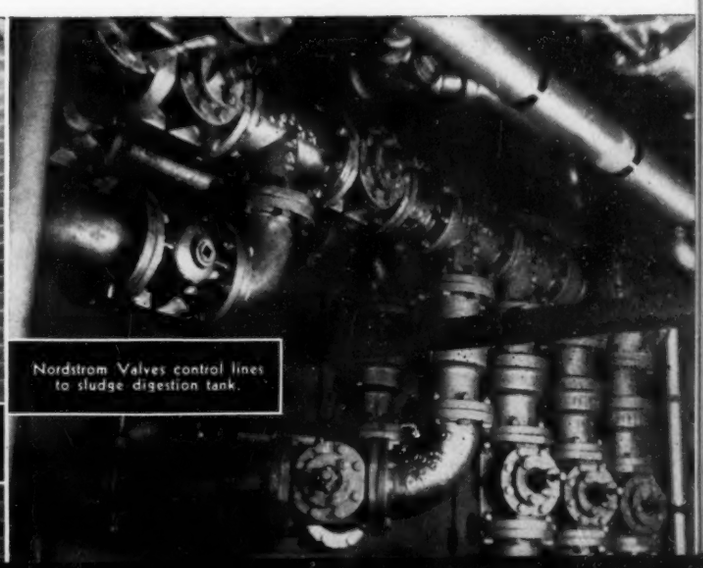
MERCO NORDSTROM VALVE COMPANY

Main Offices, Pittsburgh, Pa.

BUFFALO, NEW YORK, BROOKLYN, TULSA, CHICAGO, PHILADELPHIA, LOS ANGELES, SAN FRANCISCO, MEMPHIS, DES MOINES, KANSAS CITY, SEATTLE, HOUSTON, COLUMBIA



All gas generated is measured by this EMCO Meter; lines are controlled with Nordstrom Valves.



Nordstrom Valves control lines to sludge digestion tank.

WORTHINGTON EQUIPMENT

CENTRIFUGAL PUMPS

FOR RAW SEWAGE, SEWAGE SLUDGE AND GENERAL SERVICES

SEWAGE GAS ENGINES DIESEL ENGINES

CONVERTIBLE GAS-DIESEL ENGINES

STEAM AND POWER PUMPS

TURBINE WELL, SUMP AND DRAINAGE PUMPS

STEAM CONDENSERS AND ALL AUXILIARIES

FEEDWATER HEATERS

VACUUM PUMPS STEAM JET EJECTORS

MOORE STEAM TURBINES

REDUCING AND INCREASING GEARS

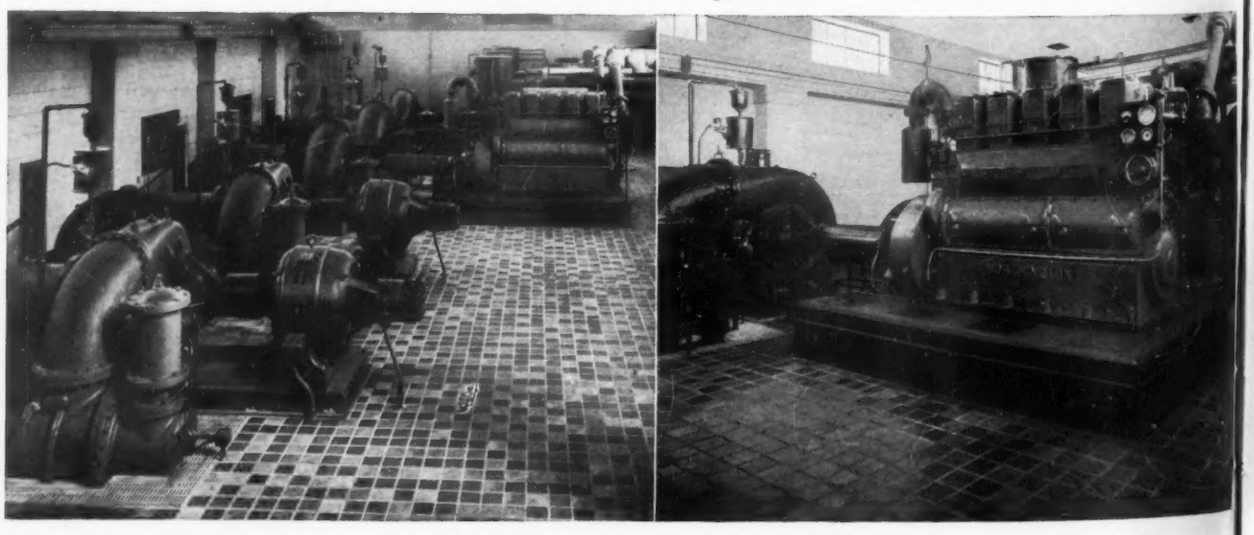
STATIONARY AND PORTABLE AIR COMPRESSORS

ROCK DRILLS AND CONSTRUCTION AIR TOOLS

MULTI-V-BELT DRIVES AIR LIFTS

• Descriptive literature is available on request

Two views at Gary, Indiana



for SEWAGE DISPOSAL

. . . is contributing prominently to the solution of sewage plant problems

Developments in the use of sewage gas engines find Worthington in a noteworthy position as evidenced by an extensive and constantly increasing list of successful installations.

And Worthington's service to the sewage disposal field includes not only sewage gas engines. Main raw sewage pumping units as well as pumping equipment for all auxiliary services will be found in a large percentage of our modern sewage disposal plants, including many of the most prominent installations.

WORTHINGTON PUMP AND MACHINERY CORPORATION • *General Offices:* **HARRISON, NEW JERSEY**

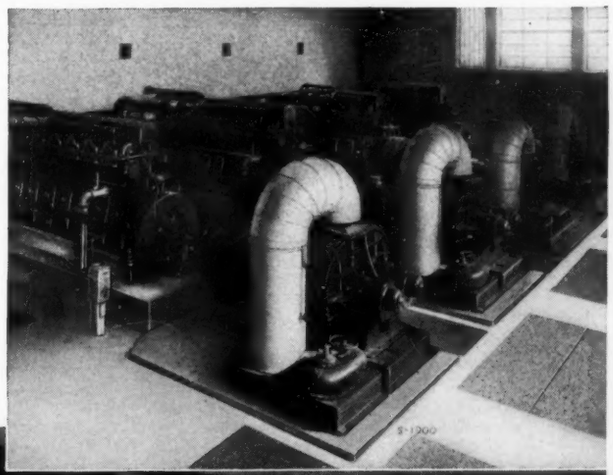
Representative of many outstanding Worthington installations are those at **TALLMAN'S ISLAND, New York,** *and at* **GARY, Indiana.**

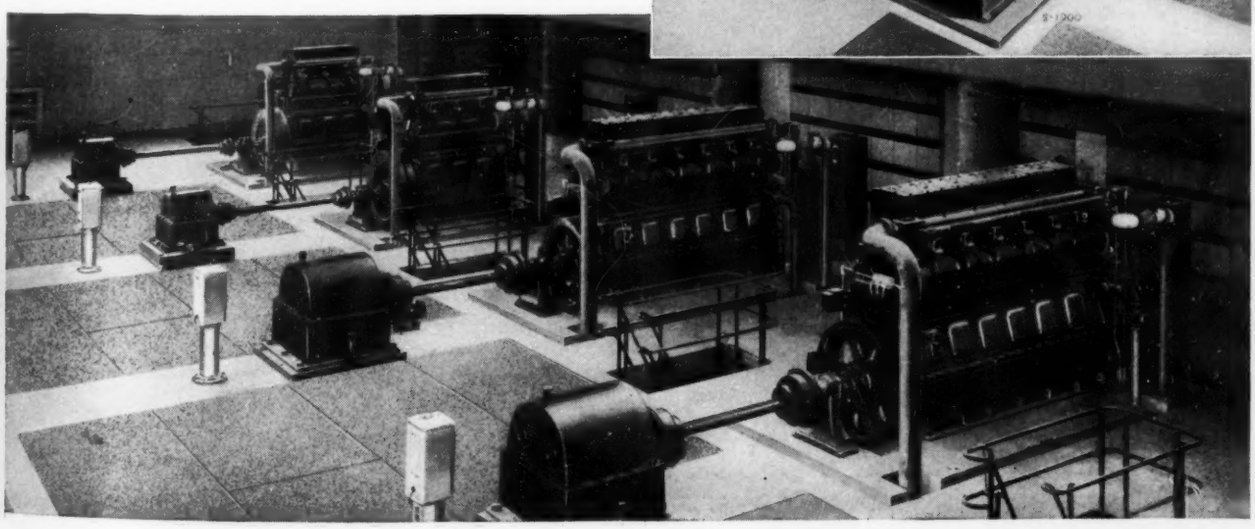
At **TALLMAN'S ISLAND** *are two 360-hp. and two 180-hp. Worthington engines, operating on sludge gas, driving Worthington vertical centrifugal sewage pumps through Falk right angle gears. Also, at Tallman's Island are two 845-hp. and two 460-hp. Worthington engines, operating on sludge gas, direct connected to Roots-Connersville air blowers for aeration service.*

At **GARY, Indiana,** *are three Worthington 24-inch centrifugal pumps, each of 20 MGD capacity, 35-feet TDH, driven by Worthington 175-hp. engines operating on sewage sludge gas. Also, two Worthington 20-inch centrifugal pumps of 15 MGD capacity, driven by 125-hp. Ideal synchronous motors. An installed capacity of 90 MGD, for handling raw sewage.*

IC1-36

At Tallman's Island



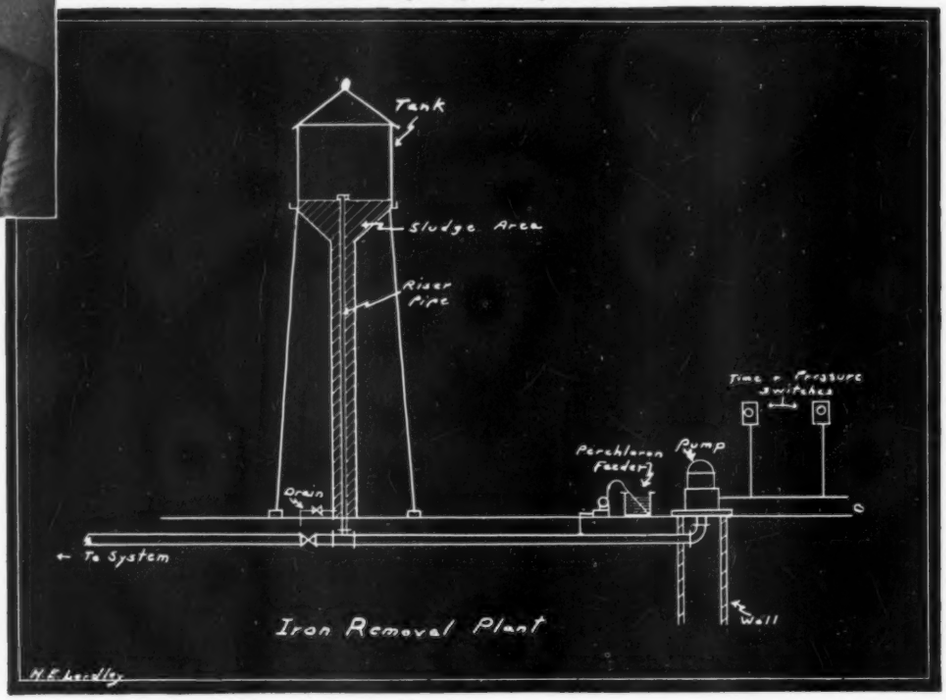


H. E. Lordley, Plant Manager

Perchloron does three important jobs in Virginia . . .

REG. U.S. PAT. OFF.

1. Sanitizes water at "a few cents per million"
2. Oxidizes ferrous iron in water
3. Removes hydrogen sulphide



According to Mr. H. E. Lordley, a waterworks engineer in Virginia, Per*chlor*on proved an unusually valuable source of chlorine by doing triple duty in a small community near Richmond. Here's Mr. Lordley's Per*chlor*on case history in his own words:

"Many of the deep-well supplies serving small communities in eastern Virginia not only show bacterial pollution but also have hydrogen sulphide and ferrous iron. In one case, the well water had an iron content of 6 p.p.m. plus hydrogen sulphide which precipitated as iron sulphide in the distribution system, and customers received black water.

"On investigation, I found that a simple treatment of only 3 p.p.m. chlorine would oxidize the iron, remove the hydrogen sulphide, and deliver a sterile water having a residual chlorine of 0.20 p.p.m. Since it was not practical to use liquid chlorine on such a small supply, Per*chlor*on was used, and the solution was fed into the system by a Chlor-O-Feeder.

"The water consumed by the system after ten p.m. was negligible, so that the pump and feeder could both be started by a time clock every night, and all the water was then pumped into the storage tank. In this tank, the riser pipe extended about five feet above the bottom, so that the oxidized iron and sludge settled to the bottom of the tank and were drawn off through a waste valve once a week. By five a.m. the water had settled, and the clear water flowed to the customers with no hydrogen sulphide, no bacteria, and only 0.5 p.p.m. iron as ferric oxide, all without the aid of filters.

"Here Per*chlor*on did three big jobs, and the community received safe water for only a few cents per million."

Per*chlor*on, with 70% available chlorine, is readily dissolved, keeps well and offers you an excellent standby source of chlorine. It comes in handy 5-lb. cans with airtight covers, 9 to the case; and in 100-lb. drums. Write Dept. WS for *free* illustrated booklet.

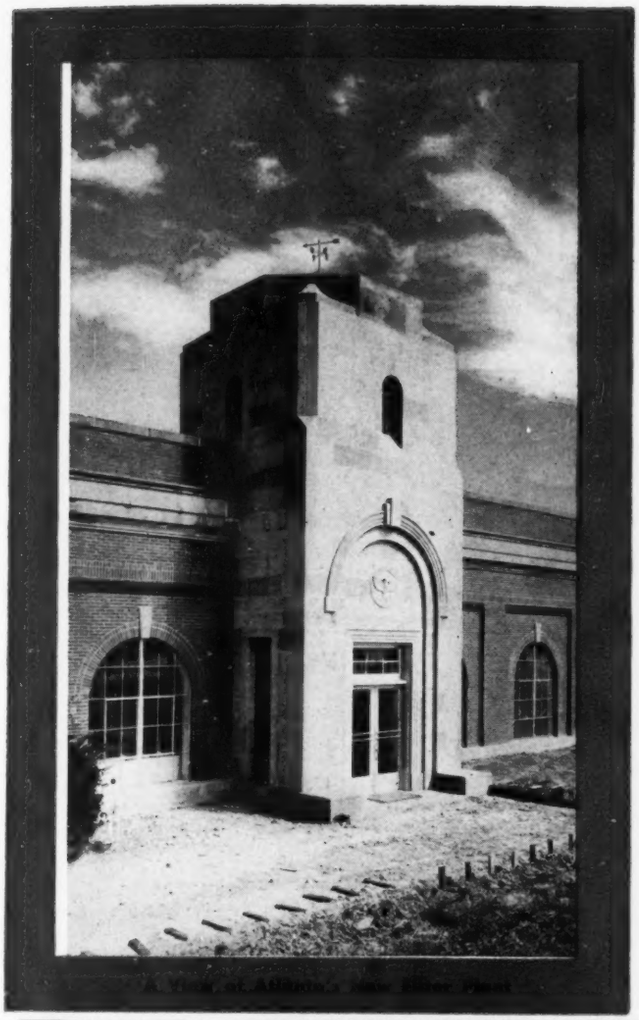
Per*chlor*on is, of course, being used for direct defense purposes and is being supplied regularly to the Government. While this makes it impossible for us to deliver normal quantities to our customers, we want you to know the facts, believing that you will cooperate with us by ordering only your immediate needs. We hope too that you will avail yourself of the services of the Penn Salt representative nearest you who may be able to help you in meeting today's unusual problems.

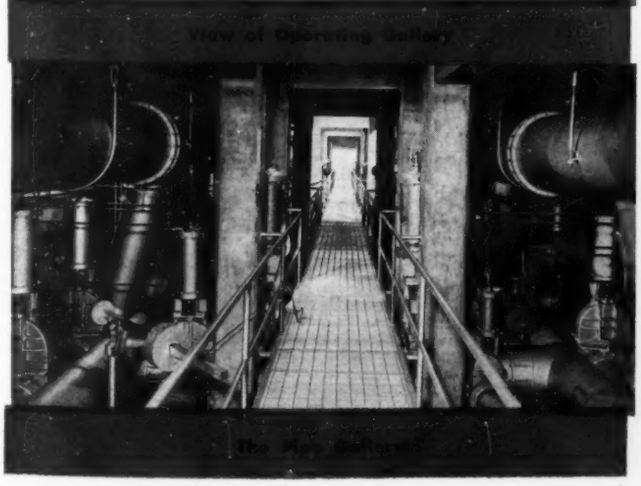
PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

1000 WIDENER BUILDING, PHILADELPHIA

New York • Chicago • St. Louis • Pittsburgh • Wyandotte • Tacoma





AT:

ANN ARBOR
CHARLOTTE
DENVER
LANSING
RALEIGH
TOLEDO
SANDUSKY

ATLANTA'S NEW FILTER PLANT

IT'S Simplex

Simplex is proud of the fact that its equipment has been included in Atlanta's new filter plant — adding to a list of the nation's leading filter plants which have been Simplex equipped. Designed by Wiedeman & Singleton, Engineers, Atlanta, Ga., Roberts Filter Manufacturing Co., Darby, Pa., equipment contractors.

Views illustrated show exterior of main building, operating and pipe galleries.

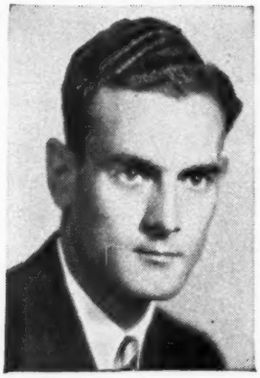
There is a Simplex instrument for every need, whether in water or sewage treatment. Simplex engineers will gladly discuss your requirements upon request.

SIMPLEX VALVE & METER CO.

WHY STUART-BRUMLEY CORP.?

Fred E. Stuart
President-Treasurer

Albert C. Brumley
Vice-President-Secretary



Burton W. Graham
Southern Sales Manager

The above fellows, whom you all know so well as the active personnel behind the Activated Alum Corp., are now planning on bringing to the water works field for the first time a very unusual type of service.

In contacting the water works superintendents, chemists, managers, purchasing agents and engineers around the country in an effort to keep abreast of the developments in the field in order to talk and visit with the users of Activated Alum and Blackalum, we have been asked why we do not represent other products for water works and give as efficient service as we do with Activated Alum and Blackalum.

Around the first of the year we started doing this, and the water works fellows have been very appreciative of the type of service we have been able to give them—as we were all raised in the water works business and know most generally the problems that confront the water works fellows.

We have decided to incorporate a separate company which will handle other items besides alum, as the Activated Alum Corp. will continue to give you the same products and type of service and be managed by the same personnel; but the new products will be handled through Stuart-Brumley Corp.

All of us will appreciate your placing the Stuart-Brumley Corp. name on your list to receive bids for alum and other chemicals.

We respectfully list below the products which we represent, either exclusively with the manufacturers or in such a way as to offer you unusual economies in the purchase of these commodities.

PRODUCTS OF STUART-BRUMLEY CORP.

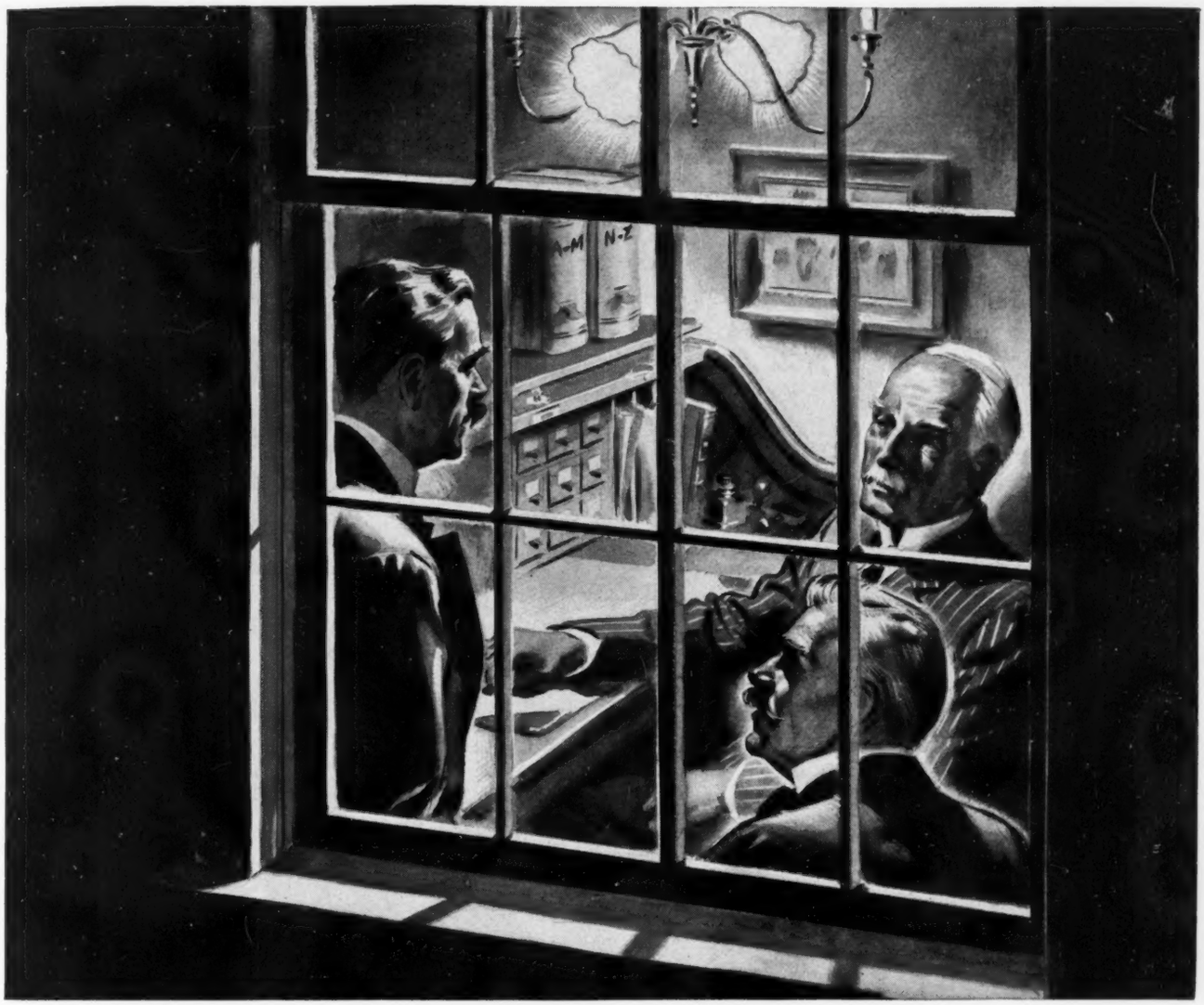
Activated Alum
Blackalum
Activated Carbon
Palmer Filter Bed Agitators
Bleaching Clay
Chemicals and apparatus
Filter Sand
Activated Calcium Carbonate
Corrosion-resisting Paint
Laboratory Stirring Machines
Water main cleaning and cement-lining

PALMER FILTER BED AGITATORS—OVER 800 UNITS NOW!

no more mud balls • longer filter runs • no shrinking • no cracking • less wash water • send for details

"The Word Alum Means ACTIVATED ALUM" to over 400 users—look at the record—send your orders for Alum to us—prompt service—no delay.

STUART-BRUMLEY CORP.
516 N. CHARLES ST. BALTIMORE, MD.



IT IS SEPTEMBER 9, 1891...

It is twilight, on an evening fifty years ago, in a young and bustling Milwaukee. Horse cars rattle through the streets, 5c beer signs swing quietly in the lake breeze. Tall-masted, broad-waisted schooners crowd the busy water front . . . And here, in this gas-lighted office, an infant industry is taking its first confident steps, as three farseeing men hold the first directors meeting of the newly-formed Chain Belt Company of Milwaukee.

THESE men had in common the belief that there was a definite need in industry for lower cost, more efficient means of transmitting power and moving materials. With a line of unique "chain belts," they purposed to fill this need.

Were they right? Did they succeed? The answer is found in Gary's roaring steel mills, in the lumber mills of the great Northwest; in the cement plants of the Lehigh Valley. It is found in Detroit's assembly lines and on the wheat-laden plains of the Dakotas. It is found wherever materials are moved, wherever power is used. In fact, there is hardly an industry which has not benefited materially through skillful and widespread use of chain belts.

Since that evening, fifty years ago, Chain Belt Company has never turned from the task of helping industry find the answer to *"how to handle it."* In doing so it has matched, stride for stride, the spectacular progress of American industry. New factories have been built, manpower has been increased, and product after product has been added to a line which now includes over 2000 sizes and types of chain belts, numerous conveyors, specialized engineering products, and a long line of construction equipment.

★ ★ ★

Baldwin-Duckworth Roller Chain Belt Division, Springfield and Worcester, Mass.; Rex Chain Belt and Transmission Division, Rex Conveying and Engineering Products Division, Rex Construction Machinery Division, Milwaukee, Wisconsin.

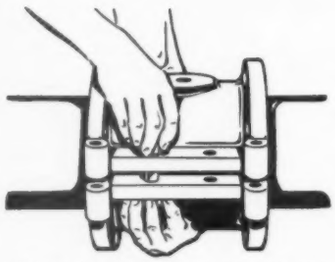
50th ANNIVERSARY 1891 REX 1941 CHAIN BELT COMPANY

CHAIN BELT CO.

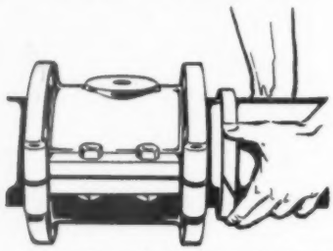
OF MILWAUKEE

CLOW-NATIONAL

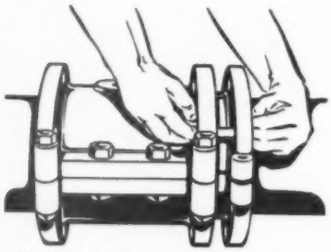
Because of its simplicity-



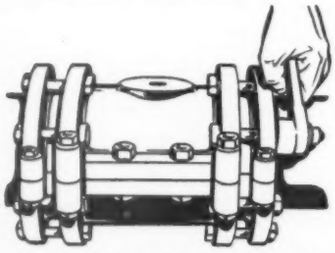
Place the two halves around pipe with the side rubber gaskets in place and bolt together loosely.



The split gaskets are next placed around the pipe at each end and pushed into their seats. Tighten up all side body bolts.



Split glands around pipe at each end of sleeve are quickly bolted on —ready for the wrench.



Tighten gland bolts with ratchet wrench, and installation is complete—a permanent repair.

MAINTENANCE MEN PREFER THE "C-N" MECHANICAL SPLIT SLEEVE FOR REPAIRING A WATER MAIN

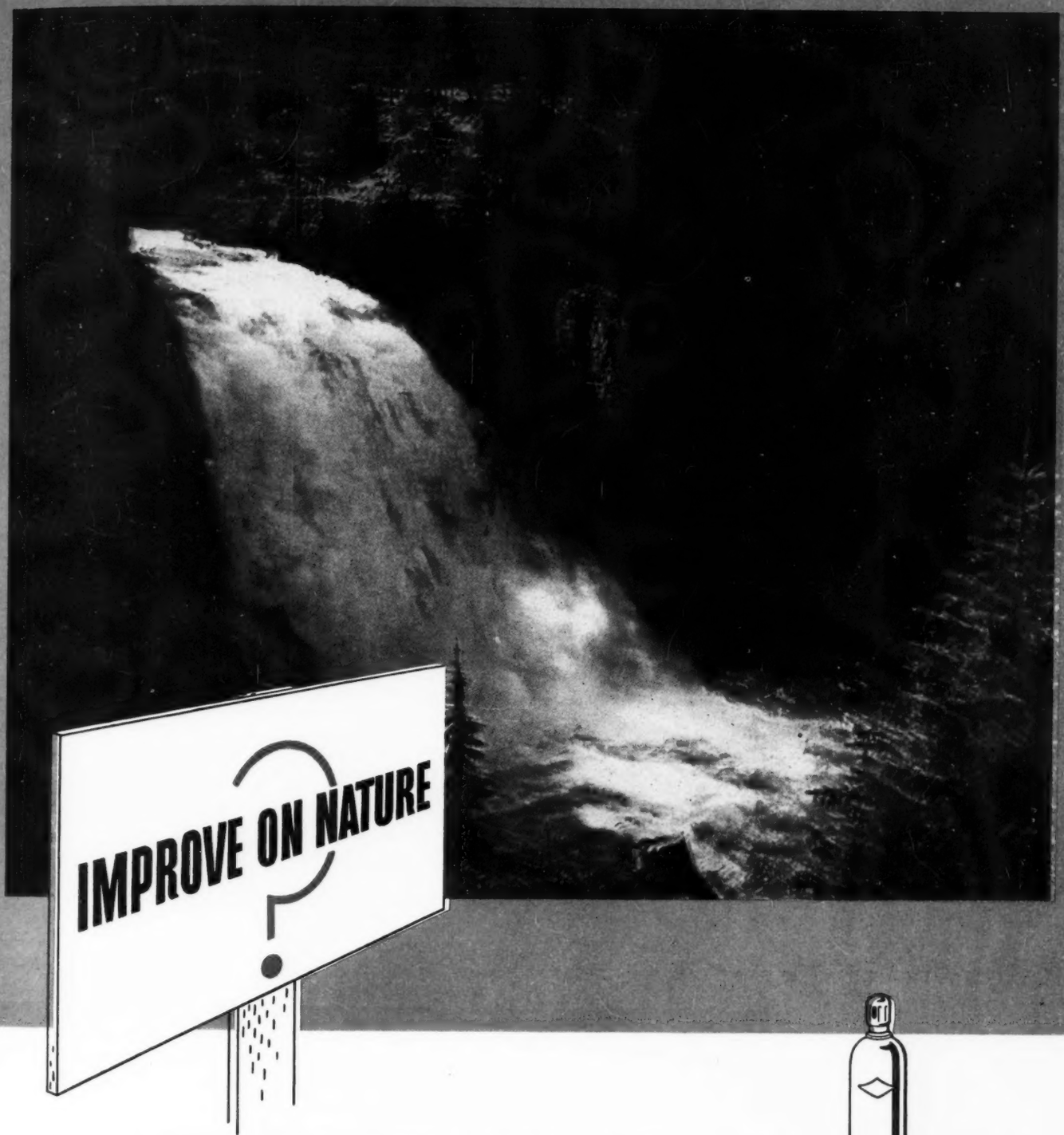
for it makes a sure and positive repair in the least possible time regardless of weather and trench conditions. With bad weather ahead, put in your order for "C-N" Split Sleeves now. We have them in stock for cast iron pipe in sizes from 3 to 16 inches inclusive.

"C-N" Mechanical Split Sleeves reach you complete and ready for instant use. No jute or lead is required and no calking is necessary. Average workmen with box wrench or ratchet wrench can apply a "C-N" repair sleeve easily and quickly, and it makes a permanent repair in the line.

See page 87 of our new catalog PIPE ECONOMY or write for descriptive Folder No. 8-29-41 for more complete information.

JAMES B. CLOW & SONS
201-299 N. Talman Avenue CHICAGO, ILLINOIS

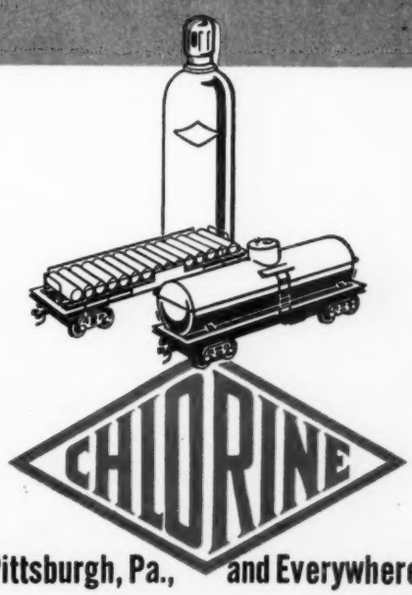
NATIONAL CAST IRON PIPE
(A Division of James B. Clow & Sons) BIRMINGHAM, ALA.



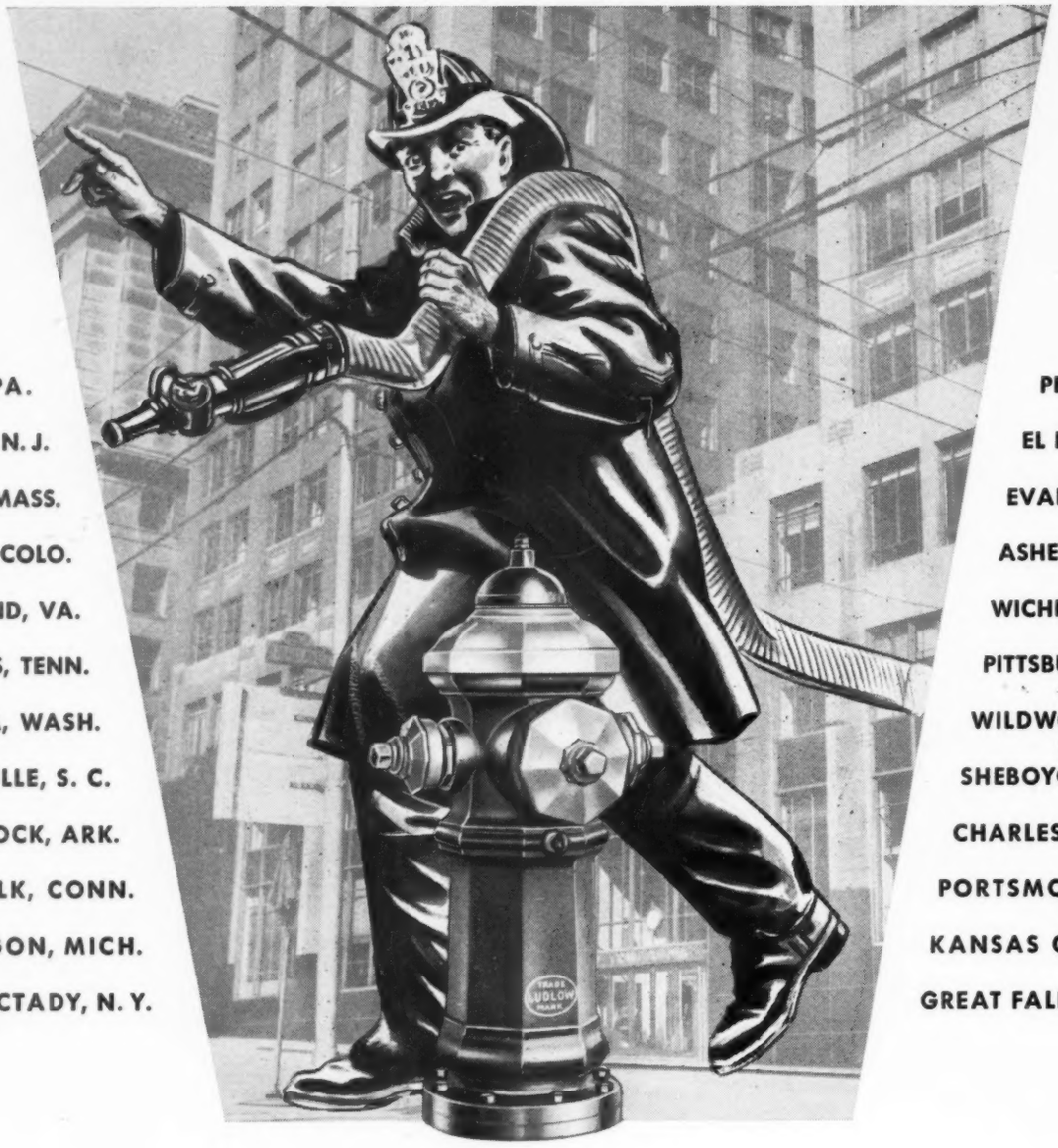
Can we improve on Nature? Certainly not on the beauty of a magnificent waterfall!

But since "raw" water frequently must be treated to make it suitable for our use, engineering skill is called upon to assist Nature by correcting various conditions.

For water treatment, DIAMOND LIQUID CHLORINE is the first choice of municipal engineers everywhere, because they know that DIAMOND Liquid Chlorine is uniformly pure and absolutely dependable. Standardize on DIAMOND Liquid Chlorine and you will always have the best!



DIAMOND ALKALI COMPANY Pittsburgh, Pa., and Everywhere



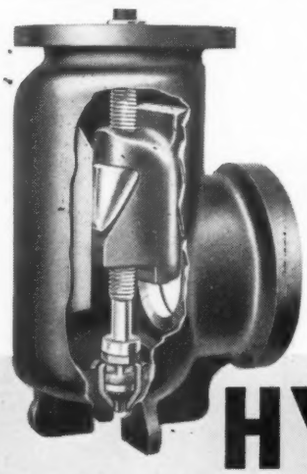
YORK, PA.
BEVERLY, N. J.
LOWELL, MASS.
DENVER, COLO.
RICHMOND, VA.
MEMPHIS, TENN.
TACOMA, WASH.
GREENVILLE, S. C.
LITTLE ROCK, ARK.
NORWALK, CONN.
MUSKEGON, MICH.
SCHENECTADY, N. Y.

PEORIA, ILL.
EL PASO, TEX.
EVANSTON, ILL.
ASHEVILLE, N. C.
WICHITA, KANS.
PITTSBURGH, PA.
WILDWOOD, N. J.
SHEBOYGAN, WIS.
CHARLESTON, S. C.
PORTSMOUTH, VA.
KANSAS CITY, MO.
GREAT FALLS, MONT.

QUICK WATER AT EVERY LUDLOW HYDRANT

The ability of Ludlow Hydrants to deliver quick water with *least possible shock* is one of the reasons why the cities mentioned above (a partial list) specify Ludlow.

The slide gate principle of hydrant construction, developed and perfected by Ludlow, assures these added advantages: proper drainage at lowest point—no freezing; wedge-locked in closed position—no flooding; hydrant easily inspected and serviced without unscrewing anything below the ground level. Write for a free copy of Catalog No. 201 which fully describes Ludlow Hydrants and Water Works and Sewerage Equipment.



LUDLOW DOUBLE GATE VALVES

Big or little, the parallel seat double-disc type slide gate valve, developed and perfected by Ludlow, has been the universally accepted construction for water works valves for nearly three-quarters of a century.

LUDLOW HYDRANTS

THE LUDLOW VALVE MANUFACTURING CO., INC. • TROY, N. Y.

SOIL CORROSION...

and how Transite Pipe can help you solve this serious water-line problem

IT IS AN ECONOMIC NECESSITY that any water carrier must be able to successfully resist a wide variety of destructive conditions underground. Soil-corrosion investigations indicate that, even in a limited area, soil conditions and corrosive intensity may vary greatly. And even areas of relatively inactive soil usually contain very aggressive spots which can only be detected by extensive soil surveys. Furthermore, the entire area may become highly corrosive with an increase in moisture content or a change in chemical characteristics due to fertilization, alterations in drainage, cinder fills or other factors.

Types of soil corrosion

Broadly speaking, there are two principal forms of soil corrosion—chemical and electro-chemical. The first is caused by direct action of soil acids and salts upon the pipe structure. The second is caused by electrolytic action between ferrous objects and materials in the soil. This latter action is similar to that of a simple electric cell. The soil represents the positive pole; the soil moisture, the electrolyte; and the ferrous object serves as the negative pole. The current generated travels to the positive pole from the ferrous object which gradually disintegrates.

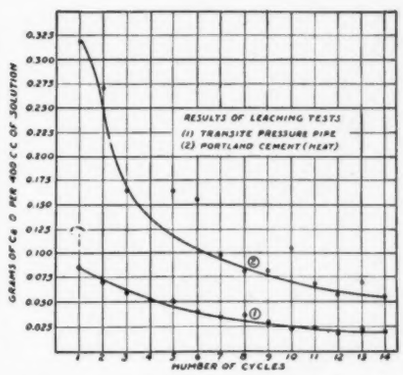
● Even in such corrosive locations as salt marshes, Transite's high corrosion-resistance assures long life and efficient service.

A practical solution

Asbestos and cement, the two non-metallic minerals from which Transite Pipe is made, have long been noted for permanence and durability. Combined and cured, as in Transite Pipe, these two materials form a durable, homogeneous structure virtually free from soluble elements. A comparison of the two curves in the diagram above at the right shows the high degree of insolubility of Transite Pipe—an important reason for its unusual resistance to chemical corrosion.

In addition, Transite Pipe is unaffected by electro-chemical corrosion. Being non-metallic, it is a non-conductor, therefore immune to electrolytic corrosion and electrolysis caused by stray electric currents.

● **This chart from the Underwriters' Laboratories report on Transite Pipe represents a series of leaching cycles for both pulverized Transite Pipe and neat cement. The small amount of lime extracted from Transite indicates that for all practical purposes it may be considered insoluble—one of the major factors responsible for its unusual resistance to soil corrosion.**



Resulting economies

The successful performance of thousands of installations, laid in all kinds of soil and under varying climatic conditions, attests to Transite's great resistance to all forms of corrosion. Even when laid in such aggressive soil as salt marshes or cinder fills, Transite requires no protective coating or wrapping. Maintenance costs stay permanently low.

* * *

In addition to high resistance to corrosion, Transite offers many other advantages contributing to more efficient, lower cost water transportation. Installation expense is reduced, for Transite's long, light lengths are easily, quickly installed. Simplex Couplings provide tight joints—are assembled rapidly even by unskilled crews. Transite's smooth interior provides an exceptionally high flow coefficient, C=140. And because of Transite's asbestos-cement composition, this figure can never be reduced by tuberculation.

● Transite Pipe offers exceptional resistance to the corrosive action of the highly alkaline soils encountered in arid regions.

NOTE TO ENGINEERS: A more complete discussion of soil corrosion and its effect on water pipe is given in the Transite Pressure Pipe Brochure, TR-11A. A copy of this book will be sent on request. Johns-Manville, 22 East 40th Street, New York, N. Y.

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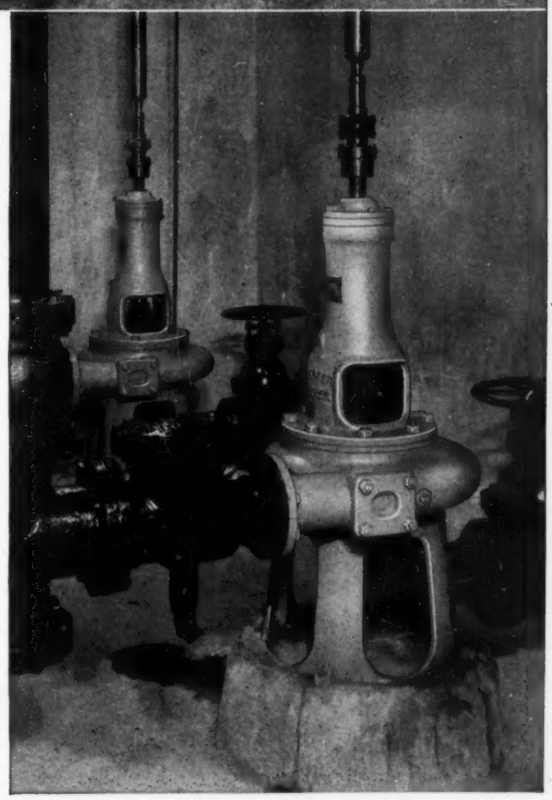

Here's another sewerage pumping station brought up to date by the installation of Gardner-Denver Type "K" Sewage and Waste Disposal Centrifugal Pumps.

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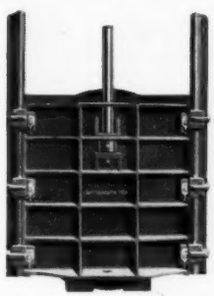

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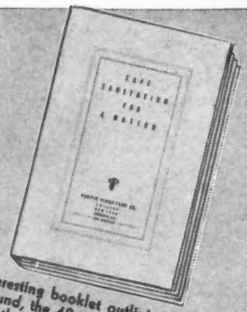

An interesting booklet outlining P.F.T.'s background, the 48 years devoted exclusively to the designing and manufacture of sewage treatment equipment and telling of our contribution to the art and science of better, safer sewage treatment.

Bulletin No. 132—P.F.T. Floating Cover Digesters—their construction, advantages and typical installations are shown.

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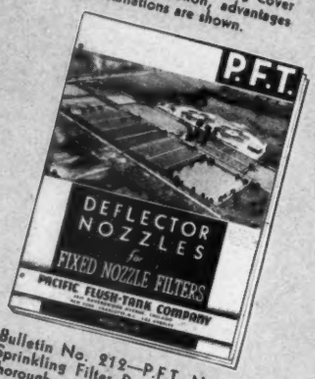

Bulletin No. 212—P.F.T. Nozzles for Sprinkling Filter Beds—describes how thorough coverage is provided—brings out theft-proof and spray adjusting features.

Bulletin 210—P.F.T. Tray Clarifiers—explains how larger quantities of sewage are handled in a smaller area with greater removal efficiency.

Bulletin No. 121-A—P.F.T. Flame Traps, Pressure Relief Traps, Waste Gas Burners, Condensate Drip Traps and Gas Pressure Gages—their use in eliminating sewage gas explosions and fire hazards.

Bulletin No. 122—P.F.T. Sewer Flush-Tank Siphons—for flushing lateral sewers where flat grades retard flow of sewage.

Bulletin 124—P.F.T. Sand Bed Dosing Controls—details siphon equipment for sand filters.

● Bulletin No. 130 (not shown)—P.F.T. Twin Tank Controls (Siphons) for efficient dosing of sprinkling filter beds.

P.F.T *Pacific Flush-Tank Co.*

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WATER WORKS & SEWERAGE

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155 East 44th Street, New York, N. Y.
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COMING!

"Maintaining Meters"

In our next issue will appear another article dealing with "Meter Maintenance and Repairs." This article emphasizes the choice of proper test rates to employ, in consideration of the actual duty the meter is called upon to perform. That is, the important consideration is at what rates shculd the household meter be required to show greatest accuracy in order that most dollars will be rung up in the office cash register, and the least unaccounted for water stand in the water department records. The question of when and why it pays (and how it has paid) to replace important meter parts, comprises another enlightening section of this paper by—

LA VERNE TRENTLAGE, Supt. of Meters, Elgin, Ill.

"The Care and Maintenance of Distribution Systems"

Is a paper which an experienced and progressive manager of a well operated water utility of moderate size was asked to prepare for use in operator's short schools. We consider it a well rounded out contribution which will prove of interest and value to operators of all sizes of water utility systems, and particularly so to the small system manager and those who have had limited operating experience. The author brands it as "elementary," but it is just the type of paper which we have been seeking for the benefit of our newer readers. The author—

FRANK C. AMSBARY, JR., Sup't, Illinois Water Service Co., Champaign, Ill.

"Dosage Control in Sewage Chlorination"

Is a paper which contains many pointers and suggestions of interest to all operators who have charge of plants at which chlorination of sewage or effluent is practiced. The contents of this paper, based on adequate experience of trained operators at the Buffalo Sewage Treatment Plant, reveals procedures developed to secure reliable and effective chlorination with the most economical use of chlorine. A section also deals with the maintenance of chlorinating equipment. The authors—

DR. GEORGE E. SYMONS, Chief Chemist,
J. W. JOHNSON, Ass't Wks. Supt.,
R. W. SIMPSON, Sanitary Chemist,
The Buffalo (N. Y.) Sewer Authority.

"Sludge Pumping"

Constitutes a problem in a number of sewage treatment plants. The Reference and Data Section of our June issue contains an article which gives many pointers and helpful suggestions in sludge pumping. We have heard the author requested to contribute the forthcoming article discuss the pumping of sludge and believe that because of his varied and close observations, and his first hand experience with this problem, his contribution will add considerable up-to-the-minute information of practical value to designers as well as to operators. The author—

STANLEY E. KAPPE, Sanitary Engineer, The Chicago Pump Co., Washington, D. C.

"Root Control With Sulphate of Copper"

Is a recital of experiences of Ridgewood, N. J., in eliminating root blockages in sewers with copper sulphate crystals added through house toilets. Not alone did the trials chemical poisoning free the lateral sewers and house connections of the obstruction, but the effect was to produce a much fresher sewage more economically dealt with at the treatment plant. The fact that the copper salt also destroyed sulphate splitting organisms adhering to the sewer walls resulted in a worthwhile chlorine economy for odor control at the plant. The author—

JOHN W. HOOD, Superintendent, Sewage Treatment Works, Ridgewood, N. J.

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WATER WORKS & SEWERAGE

VOL. 88, NO. 10 *A Gillette Publication* OCTOBER, 1941

THE MODERNIZATION AND ENLARGEMENT OF ATLANTA'S FILTER PLANT

Adds Another Chapter to This City's Filtration History Which Began in 1886 When Rapid Filtration Was Here Pioneered 55 Years Ago.

By

HERMAN F. WIEDEMAN*
Designing Engineer

and

PAUL WEIR†
Sup't. of Filtration

ATLANTA, GEORGIA

THE COMPLETION of a 33,000,000 gallon daily addition to the filtration plant at the Hemphill Station of the Atlanta Water Works marks the end of Atlanta's first "pay as you go" program which has been in operation for the past five years. Funds for this program, which amounted to $1,200,000, became available through an act of the Georgia Legislature, authorizing an increase in water rates for financing water works betterments. Supplemental funds were obtained from governmental agencies. The program consisted of extensions to the distribution system, installation of two 40,000,000 gallon pumping units, stokers and improvements and additions to the filtration plant.

Some Interesting History

It may be of interest to review briefly the history and growth of the Atlanta Water Works.

The first Water Commission of the city in 1872 contracted for the construction of a water supply on the head waters of South River, a stream now having its source within the city limits and flowing in a southeasterly direction. The system was completed and water pumped into the mains on September 8, 1875.

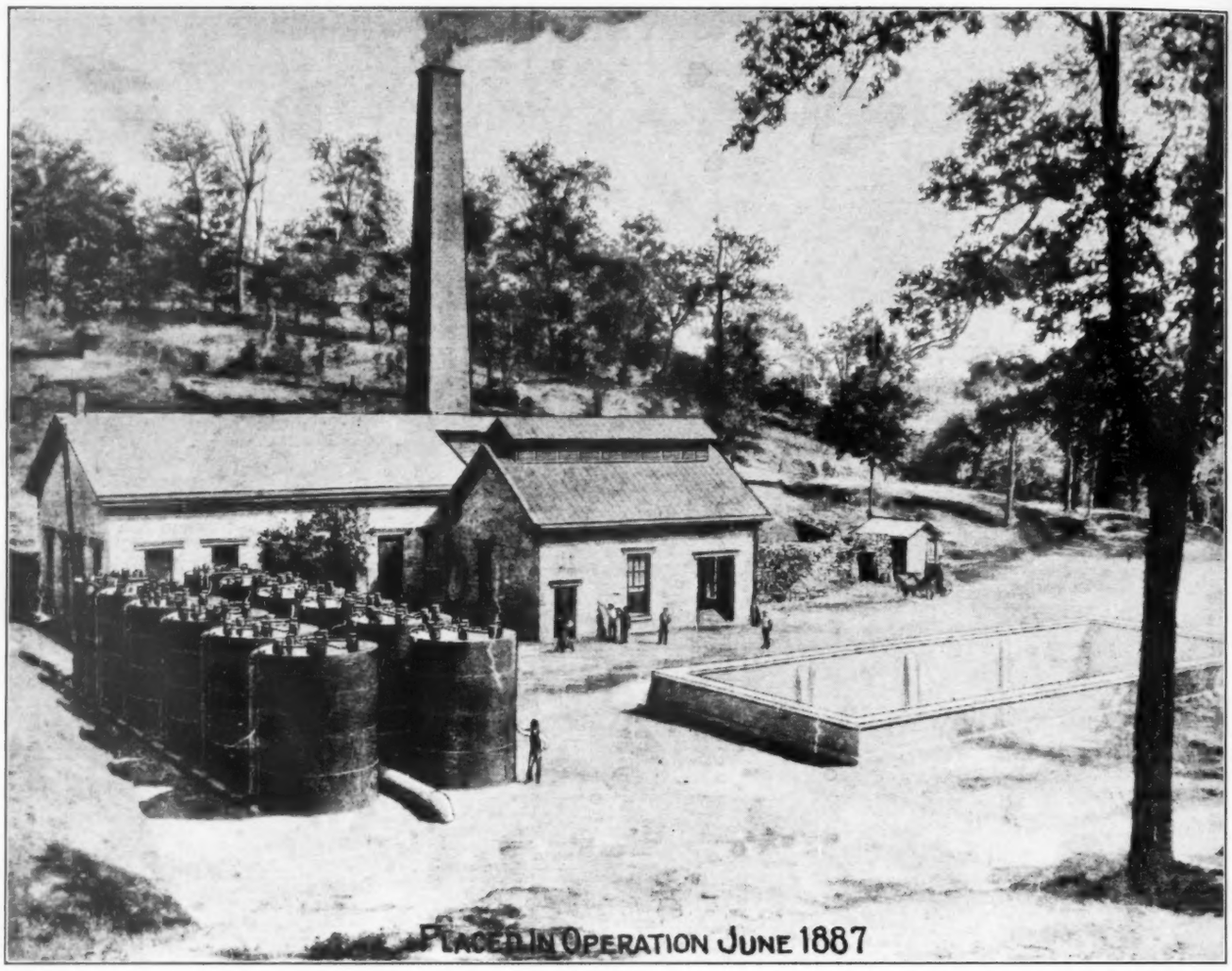
This supply consisted of an impounding reservoir on the head-waters of South River, about three miles south of the center of the city, of 250,000,000 gallons capacity, covering an area of 51 acres, with a drainage area of approximately 12 square miles. The water from this supply was originally untreated. Then in the year 1886-87 Hyatt pressure type filters were installed, representing one of the earliest mechanical rapid type installations in the United States for purifying public water supply. From the 12 pressure filters the water was collected in a clear-water basin, having a capacity of 800,000 gallons and then pumped direct to the distribution system by steam driven Holly quadruplex type pumps, one of 2,000,000 and the other of 4,000,000 gallon daily capacity.

This South River supply was supplemented in 1884 by an Artesian well, located in the center of the city, which was drilled through about 2,000 ft. of granite or gneiss—the underlying bed-rocks of Atlanta. This well produced only a limited supply of water.

Records of water used daily and annually prior to 1888 are very meager, but the total quantity pumped from South River during that year was 629,000,000 gallons. This was supplemented by 10,500,000 gallons from the artesian well supply, representing the total available from this source. It is especially interesting to note that Atlanta was also a pioneer in water metering. As early as 1888 *all* domestic consumers were metered, and a uniform charge of 17 cents per 1000 gallons was made. The per capita consumption was only 25 gallons daily, indicating that inside toilets and bathtubs were in the category of luxuries in that day.

Since a part of the drainage area of South River was even then within the city limits, and as unusual growth of the city began between 1880 and 1890, it was soon

*Of Wiedeman and Singleton, Engineers, Atlanta, Ga.
†Goodell Medalist, A. W. W. A, 1941.



"1887"
Atlanta's Pioneering 3 MGD Filter Plant
Believed to have been the first municipally owned mechanical filters of the rapid type.

obvious that South River water, although originally of unusually good quality, was becoming dangerously polluted. In addition, the supply available from this stream, with its limited drainage area, was not adequate to meet the existing and increasing demands made upon it. It, therefore, became necessary to obtain another and more ample supply.

The Chattahoochee Supply

In 1889, the city officials engaged the late Rudolph Hering to make surveys and investigations and report on a new supply. Mr. Hering's report submitted under date of October 15, 1889, recommended the development of a supply from the Chattahoochee River. This stream has a drainage area of about 1,500 square miles, with its head-waters in the Blue Ridge Mountains of North Georgia. It is a tributary of the Apalachicola Drainage Basin and flows in a southwesterly direction into the Gulf of Mexico, which course brings it, at its nearest point, within about 6½ miles northwest of the center of the city. This stream, although being highly turbid during certain periods, was of splendid quality otherwise. It received only nominal pollution and was unusually low in mineral content.

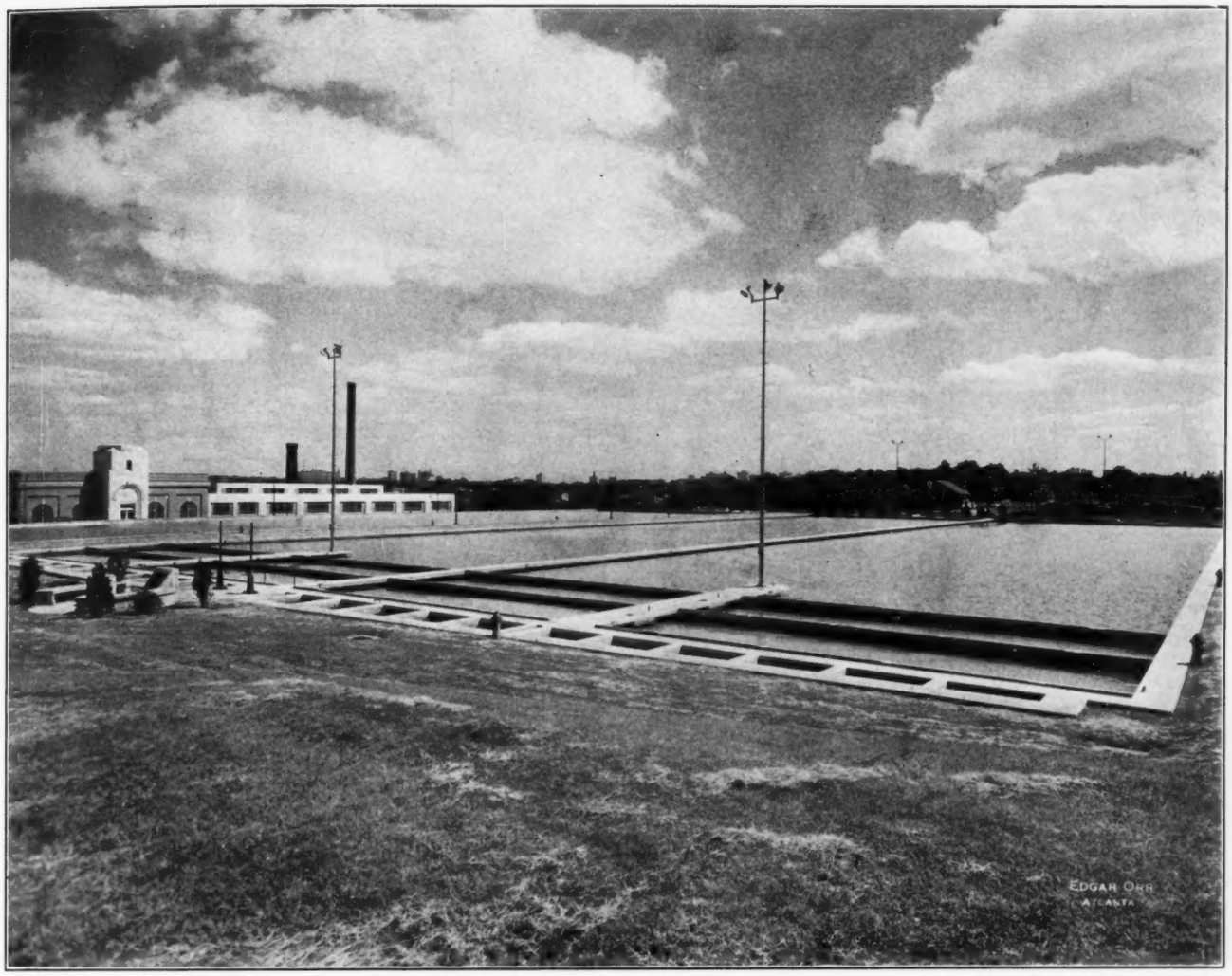
The topography of Atlanta is peculiar and interesting. It consists of a series of ridges averaging 950 to 1,000 ft. above sea level that divide the drainage of streams flowing either into the Atlantic Ocean or the Gulf of Mexico. This is an advantage from a sanitary standpoint, but the deep valleys and high ridges naturally affects the pumping problem and adds to the cost.

Mr. Hering recommended the construction of a pumping station on Chattahoochee River, with an intake at the point at which it is at present located, just above the confluence of Peachtree Creek, and the construction of raw water storage reservoirs, a filter plant, and a high-service pumping station about half way between the river and the center of the city. The point on the river selected for development was about 300 ft. lower in elevation than the highest ridges in the city, thus making necessary two pumping stations to provide adequate pressures.

The wisdom of selecting the Chattahoochee River as the source of supply and the sites chosen for the works is evident, since the present plants, now expanded to seven times their original capacity, are located on the sites originally selected.

Original Plant

The city began the development of Chattahoochee River in 1891 and placed the new supply in service in September, 1893. The original development consisted of a gravity-operated, 48-in. cast iron pipe intake about 700 ft. long, discharging into an open intake well, and



"1941"

Atlanta's Modernized and Enlarged 54 MGD Plant

With its face lifted the brick structure is the plant of 1922 *to which has been added basins and filters.*

a brick pumping station surrounded by an earth dike to prevent flood overflows. Steam-driven Holly horizontal compound pumps, operated against a suction lift of about 16 ft., delivered the water through a 30-in. cast iron main about 18,500 ft. long to an unlined raw water storage reservoir of 177,000,000 gallons capacity, constructed in cut and fill and by damming several ravines.

Potash alum was applied to the relatively clear reservoir water at the entrance of the coagulating basins, and to the pressure filter influent by means of large cast iron pots. The Logwood test, supplemented by a taste test, was used to control excessive alum application.

The water was then passed by gravity through concrete coagulating basins to a battery of new horizontal pressure type filters. These units were operated as high-head gravity filters with an average operating head of 30 ft. Free discharge of effluent entailed use of an uncovered clear water well. The total loss of head between high-water level in the raw water reservoirs and the high-water line in the clear water well was 40 ft. From there the water was conducted to the high-pressure pumping station, known as the Hemphill Avenue Pumping Station. The reservoirs, coagulating basins, filter plant, and pumping station were located on the main line of the Southern Railway about three miles northwest of the center of the city.

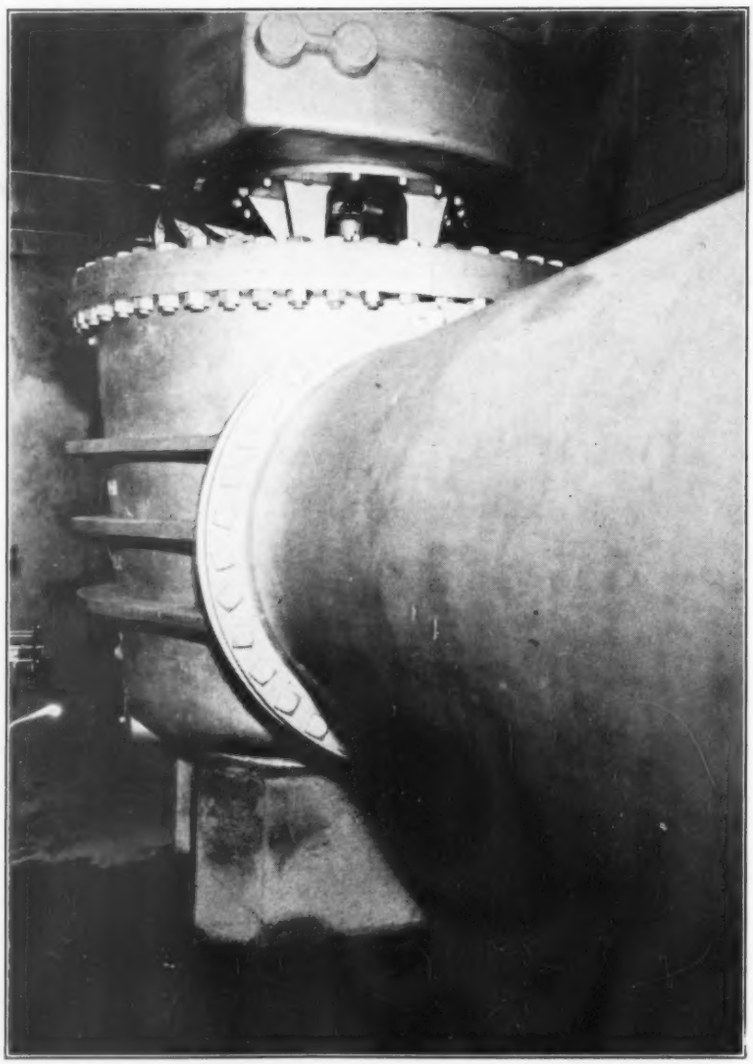
It is interesting to note that the 12 old Hyatt filters, which were of the vertical pressure type (see cut), were removed from the South River Station and installed and operated in parallel with the horizontal pressure filters at the new plant.

Between 1893 and 1920, the plant was extended along the lines of the original development. An additional 36-in. raw water supply main and another raw water storage reservoir were added, the sedimentation capacity was increased to 5 basins, having a capacity of 13,000,000 gallons, and additional pressure filters were installed, increasing the rated capacity to 21,000,000 gallons daily. Pumping capacity at the river station had been increased to 66,000,000 gallons daily and to 75,000,000 gallons daily at the Hemphill Station.

Major Expansion in 1922

Water consumption in 1920 had reached a maximum daily rate of 28,500,000 gallons with a peak hour of 40,000,000 gallons daily rate, the plant was overloaded and it became necessary to make major improvements. Construction was started in 1922 involving an expenditure of $3,000,000, which added to the existing plant, a chemical house and gravity mixer of 60,000,000 gallons capacity, a modern gravity type filter plant of 21,000,000 gallons capacity, and a 10,000,000 gallon covered concrete clear well, a 48-in. supply line from

Front Entrance to Atlanta's Revamped Plant
Over the door is the Seal of Atlanta; laboratories to the left and offices to the right.



Hydraulically Operated Chapman Cone Valve on 42" Influent Line
This little watch-charm weighs just 40,000 *lbs.*

the river. The boiler plants at both stations were remodeled and obsolete crank and fly wheel engines were removed and replaced with two 30,000,000 turbo-centrifugal units at the river station and one 30,000,000 gallon unit at the Hemphill Station.

In 1936 the maximum daily consumption had risen to 47,000,000 gallons daily and the peak hour to 65,000,000 gallons daily rate.

The old Hyatt filters had been abandoned and the total filter capacity at 2 gallons per square foot per minute of sand area was now 39,000,000 gallons daily. Therefore, during the peak periods it was necessary to operate the filters at a rate of 2.4 gallons per square foot. The demand continued to increase and rates as high as 3 gallons per square foot were required before the present additional units were placed in operation August 20, 1941.

A survey of loads and operating conditions indicated that additional mixing and sedimentation capacity, additional supply conduits and filters were necessary to provide for handling the increasing load.

It was realized that the 18,000,000 gallons in pressure filter equipment should be retired because it was difficult to operate, was not as efficient as the gravity units and was nearing the end of its useful life. When estimates were finally prepared, however, it was found that funds available would provide only for sedimentation units and additional filter capacity of 33,000,000 gallons. It, therefore, became necessary to limit the scope of the work to finances available and to continue the pressure filter units in service.

Experience had demonstrated that if a properly treated and settled water is applied to the filters, rates as high as 3 gallons per square foot could be sustained safely during emergencies.

It, therefore, appeared that since it would not be practical, because of operating difficulties, to carry on the improvements to filters and sedimentation basins at the same time, additional sedimentation basins would be of greater immediate practical value than additional filters and should be constructed first.

New Sedimentation Basins

Two sedimentation basins known as No. 6 and No. 7 were constructed in 1938. These basins are each 417x100 ft. in plan, are 14 ft. deep, with a common side wall, and have a total capacity of 8,000,000 gallons.

Water is drawn from the present gravity mixing basin through a 6x8 ft. concrete inlet conduit to a distributing well provided with 60x60 in. sluice gates to control the flow. This well is also provided with a guide vane to prevent turbulence due to change in direction of flow. From the receiving well the influent passes into transverse feed channels, proportioned to maintain fixed velocity in the channel

Filter Operating Floor of the New Addition

A bank of 3 units of 5 mgd. capacity on each side and a single 3 mgd. unit adds 33 mgd. capacity to the 21 mgd. plant of 1922.

as water is drawn into the basins through 2 ft. x 2 in. ports distributed along the channel.

The foundation is a hard clay and rock and the walls were designed as cantilevers.

Maximum soil pressures at toe of cantilevers do not exceed 2,700 pounds per sq. ft. Joints are placed in side walls at 40 ft. intervals and are provided with steel stop plates and mastic applied to the joint surface with hot tar. Floor joints are made at the same intervals over a concrete sealing block which was coated with hot asphalt before the slabs were poured. A ½ in. joint was provided in the slabs, this being later poured with bituminous material.

Provisions were made for the installation of mechanical mixers and flocculation units at a later date, these mixers to consist of three rows of transverse paddles separated by transverse baffles. In order to decrease maintenance costs, all baffles were constructed of concrete applied with a cement gun.

Provision was also made for the future installation of equipment for mechanical removal of mud from the basins.

The present units are cleaned manually, the discharge passing to a storm sewer. The sewers of Atlanta are of the combined type and when the coagulation basins are washed at the water plant it is necessary to bypass the Clayton Sewage Disposal Plant, which handles 30,000,000 gallons of waste daily, to prevent upsetting the operation of the plant. The construction of a separate sewer from the water plant, which would bypass the sewage disposal plant, is under consideration but is expensive because it involves a considerable amount of tunnel and therefore has not been constructed. Mechanical removal of mud would result in a saving in settled water and in labor charges.

The outlet of the basins passes over a weir and through the bottom of a slotted concrete outlet channel. The depth of water in the basins is subject to variation, due to change in water level in the supply reservoirs, and it was therefore necessary to stop the weir wall 5 ft. from the top of the basin to allow for emergencies. Counterweighted sector gates with aluminum skin plates, worm and gear operated, were mounted on the weir wall to provide a method for regulating the depth of water over the outlet weir. This method of regulating depth of water over the outlet has been help-

ful in preventing short circuiting and in increasing settling efficiency.

Each basin discharges through a 48-in. cast iron pipe controlled by a 30-in. manually operated cone valve. The reduction in diameter of the outlet pipe is used to measure the discharge through each line by means of float tubes connected to inlet and throat. These operate a flow indicator mounted above the cone valve.

Filters

The original installation of gravity filters made in 1922 consisted of seven units of three million gallons daily capacity each, constructed in single bank. It was thought that this method of construction would have the advantage of easy access to the filter control equipment and the additional cost of construction would therefore be justified. Provisions were made in the original design to extend the plant at right angles to form an L shape structure which would place the laboratory and plant offices in the angle of the L.

This plan of extension has been followed in the design of the new addition, but it has been necessary to abandon the idea of single bank construction for the double bank type because of space limitations, higher cost of construction and from the standpoint of operation because of the greater area of plant to be maintained and operated when constructed in single bank.

The units as constructed consist of one unit of three million gallons capacity, for which provisions had originally been made and which could not be changed, and six units (44x44 ft. in plan) of five million gallons daily capacity each, arranged in double bank.

In order to avoid the necessity of constructing additional wash water storage and larger wash water supply lines, the units, which are constructed with a central wash water gullet, are arranged so that they may be washed in two sections. Thus, the required wash water rate is actually less for these 5 mgd. units than for the original 3 mgd. units.

All pipe in the plant larger than 6 in. is of welded steel. Flanges, where used, are rolled steel welded to the pipe. On straight runs of pipe through the pipe gallery field—welds were used except that mechanical couplings were required for each 40 ft. of run, and were employed also at a number of other points to provide for ease in the removal of valves or other equipment if necessary.

Exposed pipe and fittings in the gallery were lined with hot bituminous material 1/16 in. thick and painted outside with red lead and aluminum paint. All lining was tested for holidays at 15,000 volts before erection. Pipe in trench outside the plant was lined as above and was coated and wrapped with asbestos felt. Field-welds were not permitted on pipe in trench, all joints being made with mechanical couplings.

Because of the liberal provision for couplings and careful field work in setting thimbles in the concrete, no difficulty was experienced in fitting and erecting the gallery piping.

Filter laterals of 3 in. cast iron are cement lined with a seal coat. Placed on 12 in. centers, these are connected at the middle with 3x3x5 in. tees opening into a concrete conduit beneath the filters. Concrete blocks of the Wagner type are placed between the laterals. They extend from the filter floor to a point above the center line of the laterals. This insures an unobstructed water passageway where it is most needed and also improves hydraulic factors. Copper pipe, one-half inch in diameter, is connected at the top of the tees and vented above high water level on the filter wall. These tubes were installed for the purpose of releasing entrained air in the lateral system.

The pipe gallery is provided with a steel walkway through the center for inspection purposes and is readily accessible from the operating floor.

The elevation of the top of filters is 10 ft. lower than the sedimentation basins and the flow into the plant is controlled by a hydraulic cone valve and two hydraulic gate valves which are operated from a table facing the venturi meter instruments, recording the flow into and out of the plant. Three lines, a 60 in. and two 48 in. lines, supply settled water to the plant.

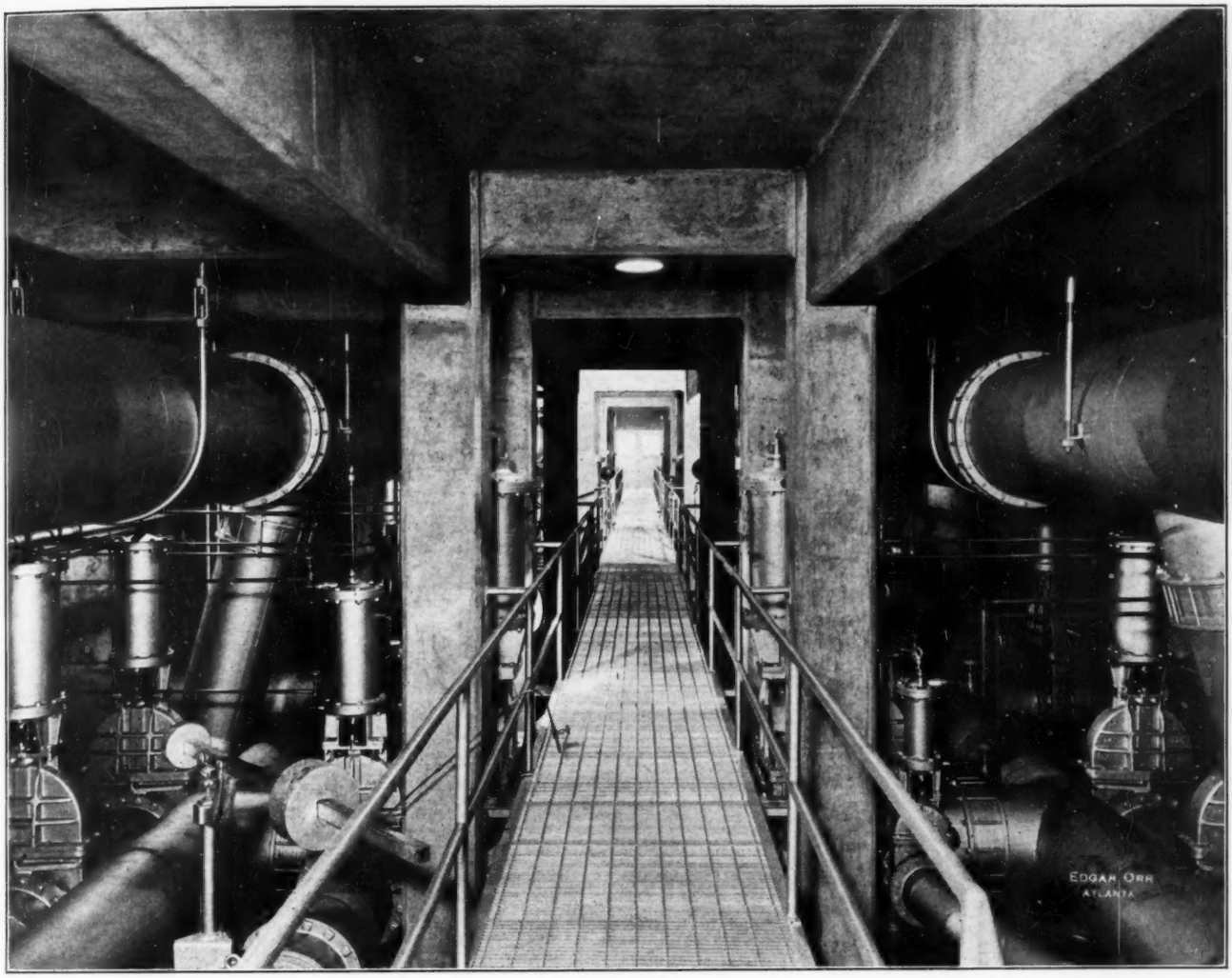
The effluent from the original gravity plant discharges through a 60 in. conduit. The new filters may discharge through this line or through two separate 48 in. lines which are connected to other points in the effluent piping system.

All piping is so arranged that the original plant and the addition may be operated separately or together and the failure of any of the main influent or effluent lines will affect the operation of the plant only for such period as is necessary to change over to another line. All main control valves are either hydraulic gate valves or hydraulic or manually operated cone valves. This will enable one operator to handle valve operation readily.

Flow into and out of the plant is measured by five venturi meters, the indicating and recording instruments

A Central Valve Control Station

The operator when setting control valves at the hydraulic valve operating table faces a battery of Builders meter units, indicating and recording flows at the several points throughout the plant.



The Pipe Gallery

Spacious and well lighted. Note the use of light weight bituminous lined steel pipe and flexible couplings.

being grouped at the center of the plant. These meters, because of the low head and distance from the operating centers, and are air operated.

Architecture

A radical departure from the architecture of the old plant was necessary in the construction of the addition because of the change in design from single to double filter bank. This was accomplished by transferring the main entrance from the south side of the plant to the west side and giving it prominence and character by adding an entrance tower of limestone. The addition has been treated frankly as an addition by offsetting the building line and changing the window and trim details entirely.

Future Expansion

The Atlanta filtration plant now has a normal capacity of 72 million gallons daily, of which 18 million gallons may be considered and obsolete space is available for an additional 30 million gallons. Sedimentation basin capacity at six hours' retention is 84 million gallons daily and no additional space is available in the immediate area at proper elevation. The present maximum daily rate of consumption is 55,000,000 gallons.

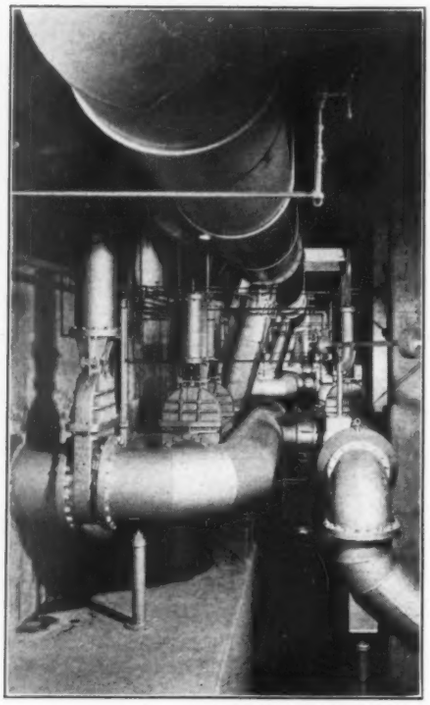
The consumption north of the city and outside the city limits is increasing rapidly and distribution problems in that area are critical, since the area of growth is at least 10 miles from the plant and that distance is constantly increasing. Since the plant is nearing the limit of its capacity to expand and large scale expenditures will be necessary if distribution is continued from the present plant, the location of a new plant on the river and near the expanding area is indicated in the near future.

Personnel

The Atlanta Water Department is operated under the efficient administration of W. Zode Smith, general manager, whose vision and ability have been vital factors in the department's expansion to meet the city's ever increasing demand upon it. Paul Weir is superintendent of filtration, and Meredith Collier is superintendent of construction and distribution.

The plant was designed, constructed and supervised by Wiedeman and Singleton, with Lowell Cady in charge of design, and Albert Eldridge as resident engineer.

Contractors were Smith & Pew Construction Co. of Atlanta, and Roberts Filter Manufacturing Co., Darby, Pa., who furnished and installed the filter equipment.



A Close-Up View
Valves and piping of one 5 mgd. filter, each unit being equipped for sectional wash, one half at a time.

Equipment was furnished by the following manufacturers:

Coating steel pipe—Wailes Dove-Hermiston Co.

Cone and gate valves—Chapman Valve Mfg. and Rensselaer Valve Co.

Copper pipe and fittings—Mueller Brass Co.

Equipment for casting Wagner filter blocks—International Filter Co.

Filter controllers—Simplex Valve & Meter Co.

Filter laterals and C. I. Pipe—American Cast Iron Pipe Co.

Fluorescent lighting—Westinghouse Elec. & Mfg. Co.

Iron railings—Calvert Iron Works.

Laboratory equipment—E. H. Sheldon Co.

Sand and gravel—Southern Silica & Mining Co.

Skin plates on floor regulating sector gates—Aluminum Co. of America.

Square bottom valves—Rensselaer Valve Co.

Steel pipe—R. D. Cole Mfg. Co.

Switchboards and miscellaneous electrical units—Cleveland Electric Co.

Transite wall-board and ceiling—Johns-Manville Corp.

Unit steam heating system—Crane Co.

Venturi meters—Builders Iron Foundry Co.

Jack Fugate Gets Promoted

Now Heads A.W.W.A.'s P. M. & O. Division

"G. L. F."

A.W.W.A. headquarters announces the quick promotion of G. L. Fugate, Chief Engr., Houston, Tex., Water Dept., to chairmanship of the Plant Management & Operation Division.

Mr. Fugate was just elected Vice-Chairman of the Division in June at the Toronto convention. Scotland G. Highland was elected Chairman of the Division but asked to be relieved. This necessitated calling back W. R. LaDue and his nominating committee, which chose the following slate for the Division. The selections have the approval of the Executive Committee and the following are declared elected:

G. L. Fugate, Chairman.
J. Clark Keith, Vice-Chrmn.
Frank C. Amsbary Jr., Sec'y-Treas.
D. O. Ketcham, Director.
F. O. Porter, Director.

To Stop Pipe Sweating

By Chas. P. Hoover,
Principal Ass't Superintendent, Division of Water,
Columbus, Ohio

The following formula, directions for application, and specifications for materials required in the application of an insulating protective coating for stopping troublesome sweat formation on pipes, pumps, small tanks, etc., has proved highly satisfactory according to Chas. P. Hoover, Consulting Chemical Engineer and 1st Ass't. Superintendent of Water Works at Columbus, Ohio.

Application Procedure

All surfaces must be absolutely clean and dry before any applications are made. The outside surface is first painted with a thick coat of adhesive, (specified herein), after which a thick coat of ground cork is either blown or pressed on by hand. This ground cork must be built up to a uniform thickness on all exposed surfaces. After this application is thoroughly dry, a second thick coat of adhesive is applied, after which the second thick layer of ground cork is either blown or pressed on by hand. The second layer of ground cork must also be built up to a uniform thickness. After the second application is thoroughly dry, it is covered with two coats of an approved paint.

The Adhesive

The adhesive is made up of the folowing materials:

Ingredients	*Proportions*
Whiting, dry	7¾ lbs.
Interior Varnish ..	4¼ lbs.
Raw Linseed Oil ..	¼ lb.
Paint dryer	¼ lb.

Cork Specifications

In purchasing the cork to be used the following specifications will be found helpful:

The cork shall be equal in quality to 8/14 granulated cork as manufactured by the Armstrong Cork Co., Lancaster, Pa. It shall be ground so that not less than 95% by weight of the particles will pass through a No. 8 U. S. standard sieve and not more than 5% by weight will pass through a No. 14 U. S. standard sieve. The cork shall not weigh more than 8 lbs. per cubic foot. The cork shall contain not more than 1.5% of dirt, dust, or other foreign matter.

It is to be noted that all of the above, with slight changes in a word here and there, will produce a complete specification for materials as well as the method of application should the insulating job be let to contract.

1941 N.E.W.W.A. CONVENTION

Of Record Size for Boston Convention

ALTHOUGH the 1941 Annual Convention of the 60 year old New England Water Works Association, in Boston September 23rd-26th, was not as large as some held in New York City, it was of record making size for all N.E.W.W.A. conventions held in Boston. This fact has even more significance when realizing that prevailing conditions have been responsible for a slump in attendance at meetings during 1941 generally.

Presidents

Leland G. Carlton
Supt. of Water
Springfield, Mass.
(Retiring)

F. H. Kingsbury
Mass. Dept. Health
Boston
(Incoming)

The record figure for Boston registrations was 720, but another observation—namely, that the great influx of attendants occurred the second day of the convention—is indicative. It was the second day's program that featured so much of timely interest in the nature of management, operation, maintenance and construction during the national emergency, with particular reference to property protection and procurement of materials and equipment under priority regulations. It was on the second day that the convention heard a preparedness and property protection talk by F.B.I.'s Special Agent—G. V. Doherty; a recounting of the civilian defense organization and planning, with especial reference to water works, by Arthur D. Weston for Massachusetts and Warren J. Scott for Connecticut; a discussion of water works operations under emergency conditions, and advices on progress in securing priority ratings for water works and procedure to follow by water utility managers in order to obtain the necessary rating and priority number by A.W.W.A.'s H. E. Jordan, direct from Washington with the latest information and copies of the new Form P-46 which now supersedes all earlier forms.

The influx of attendants on this same day is indicative that the technical program of meetings in the water and sewage fields is still the feature of the convention which constitutes the biggest single drawing card. Following the session devoted to defense matters some new fire fighting equipment of Boston Fire Department particularly adapted to emergency and civilian defense use was demonstrated near the hotel. Of especial interest were the three new trailer type pumping units of the Fire Department and valve operating trucks of the Water Department.

Baylis Honored for Second Time

John R. Baylis, Physical Chemist, Department of Public Works of Chicago, was for the second time in a few years honored by the Association in recognition of his technical prowess and contributions to the N.E.W.W.A. Journal. At the opening luncheon the award of the coveted Dexter Brackett Medal was made to Mr. Baylis for his paper, "Filter Operation and Maintenance," which he presented before the Association's 1940 Convention and which has since been printed in the JOURNAL.

The presentation was made by Fred Shepperd, Editorial Director of "Water Works Engineering," as Chairman of the Award Committee for 1941. Unfortunately, Mr. Baylis, because of the awarding of contracts on the new Chicago Filter Plant, was prevented from being present to receive the medal. On behalf of Mr. Baylis, who has long been a valued contributing Associate Editor of WATER WORKS & SEWERAGE, L. H. Enslow, Editor, accepted the medal and read a letter of acceptance from Mr. Baylis. It was recalled by Mr. Enslow that as shortly ago as 1938 Mr. Baylis had been presented with the Dexter Brackett Medal on the same platform, and that the second award of it to the same man was a matter of which the medallist could with justification take exceptional pride.

Secretaries

Frank Gifford
Consulting Engr.
Dedham, Mass.

Cornelia Sachs
Asst. Secretary
Boston

Entertainment

Space limitations necessitates only a sentence to the effect that the opening dance, the dinner-dance and the floor-show and smoker were all as enjoyable as usual if not more so. In fact we think special note should be made of the splendid music supplied and of the quality of the several acts comprising the Wednesday evening floor-show at the smoker arranged by Clinton Inglee, as Chairman of Entertainment. The ladies were in addition treated to a Historic Tour of Boston, a Bridge-Luncheon and visit to Harvard University's Botanical Museum with its famed collection of plant models in blown and handwrought glass.

Vice-Presidents

Harold Brigham
Supt. Wt'r & Sew.
Marlborough, Mass.

Horace Clark
Supt. of Water
Sanford, Me.

Amongst the active members playing in the golf-tournament, Don Calderwood (Nashua, N. H.) and Roger Esty (Danvers, Mass.) came in with first and second low-gross scores. Amongst associate members Hollis Cranmer and Francis Hersey were low, with 75 and 77 respectively. In all 18 prizes were distributed by H. W. Ford, Chairman of the Golf Committee—almost one per player.

New Officers

Officers announced for 1941-42 are:

President

Francis H. Kingsbury, Senior Engr., State Dep't of Health, Boston.

1st Vice-President

Harold L. Brigham, Sup't, Water and Sewerage Board, Marlborough, Mass.

2nd Vice-President

Horace L. Clark, Sup't, Water District of Sanford, Me.

Secretary

Frank J. Gifford, Consulting Engr., Dedham, Mass.

Treasurer

Abel Reynolds, Treasurer, N. E. Water, Light & Power, Providence, R. I.

Directors

Karl R. Kennison, Boston,
Harold W. Griswold, Hartford,
Arthur L. Shaw, Boston.

Business Sessions in Brief

The report of the Secretary revealed 35 new members during the year, but a net loss of 3 members, which Harold Brigham, Chairman of Membership Committee, lamented as not representing a healthy condition and about which something was to be done. Total membership is now 798 as compared to 801 and 791 for the previous years.

Gross receipts amounted to $10,568 of which $3,300 represented Journal advertising sold and $5,800 came from dues. Treasurer Reynolds reported total Association assets to be $23,776 and the net operating profit for the year to be $1,098, or something less than for the year previous. Editor Fair's report mentioned a total circulation of 944 copies of the Journal per issue at a per member gross cost of $5.62 per year, which after deducting advertising income and minor receipts netted a cost of 35 cents per member for the four issues of the Journal. This compares to a profit of 78 cents per member the year previous.

Henry T. Gidley (Fairhaven, Mass.) Finance Committee Chairman, reported a 1941-42 budget of $9,975 total, containing $4,100 for the Journal.

Arthur C. King (Taunton, Mass.) Legislative Committee Chairman, reported that Maine now has a special Sabotage Act which permits guards on water properties to place trespassers under arrest without warrants. Also, public roads may be closed through water works properties if circumstances warrant. He also reported the passage of an important anti-pollution act in Massachusetts, and defeat of an act which would have prevented recourse to the shut-off or reduced pressure scheme in collecting water rents.

E. Sherman Chase reported that the Association had sent over to the British Institute of Water Engineers a gift of something better than $100. (25 pounds) for use in war relief assistance to members.

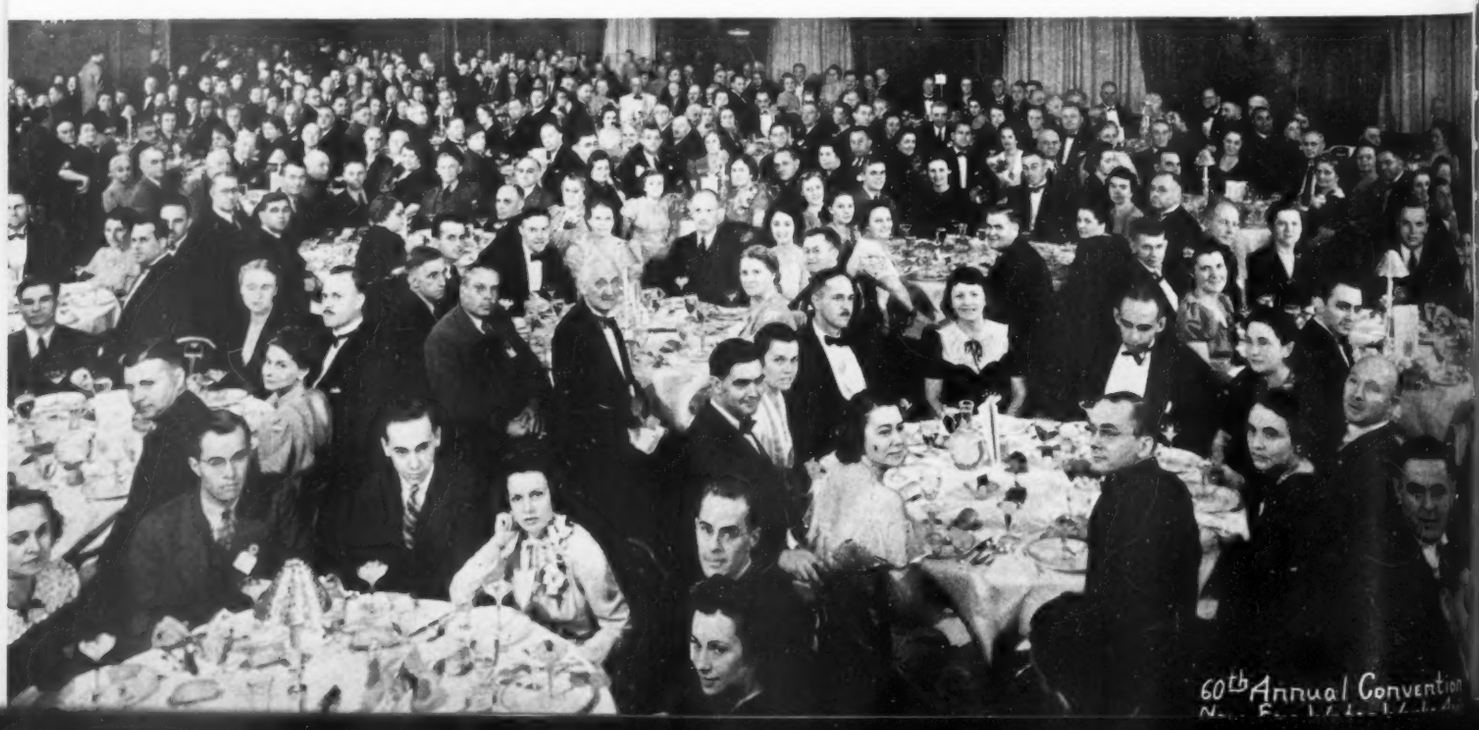
Committee on Committees

As Chairman of the highly useful clarifying and progress prodding Committee on Committees, Warren J. Scott, presented his customary illuminating report briefly recounting the status and progress of the 24 committees of the Association for the benefit of the membership at large. Amongst recommendations by the Committee on Committees is that of supporting and aiding in the establishment of a Water Works Defense Committee in each of the New England States and that a clearing house committee be established in the Association, consisting of a representative from each such state committee. Another is that more adequate publicity work be conducted by the Association in behalf of water works employees in their own communities. New committees were suggested for the following: water quality, cathodic protection, corrosion and remedial measures, sluice gates, survival and retirement experience with water works facilities. In the last two it was suggested that N.E.W.W.A. participate in the work already begun by A.W.W.A.

Harry U. Fuller (Portland, Me.) in discussing and supporting the committee's recommendations told of the start in the direction of pooling inventories of water utility equipment through a central clearing house and this and other defense activities would benefit from coordination that a regional committee in the Association would provide. He told of the School of Water Supply Defense conducted on a circuit in Maine under the direction of Stephen H. Taylor of New Bedford, Mass., these lectures by the several experts retained now being available in book form and for sale by the Maine Water Utilities Association at $1.00 per copy. Later in the meeting some of these texts were displayed by S. S. Anthony, Editor of the Maine Water Utilities Association; and the supply then available was quickly exhausted.

Session on Defense

This session was opened by a report from the Committee on Sab-



otage, presented by Francis H. Kingsbury, Chairman. The report stated that there had been no attempts at sabotage in water supply reported, but that an ever watchful eye should be kept on the situation. Naturally all boating and fishing on water supply reservoirs should be prohibited without question. Fencing and flood-lighting of some properties had been provided, but the single most important preventative is that of making positive of the history and loyalty of operating personnel.

F.B.I. Advice

From the Boston F.B.I. office came G. V. Doherty, Special Agent, to discuss "Sabotage Prevention." Mr. Doherty pointed out that water works men in general should use great care in guarding against letting out information to unknown persons who may wish to learn where the vulnerable points on a system are. Watch the office files and map vaults and do close check-up on the history of plant personnel, associations, relatives, organizations, even to the extent of fingerprinting of each employee.

Officialdom
Arthur D. Weston, Chief Engineer Mass. Dept. of Health, Boston
Gordon M. Fair, Professor of Sanitary Engineering, Harvard University (Editor of the N.E.W.W.A. Journal)
Samuel M. Ellsworth, Consulting Engineer Boston (Chairman of the Program Committee)

Mr. Doherty pointed to the weakness in such times of having watchman duty performed by old employees. Slow in action and thinking, their value was limited. To arm guards is a hazardous matter unless the weapon is in better shape than most watchmen carry and until the wearer has been taught how to use it effectively.

Mr. Doherty preached the gospel of carefully checking machines which have been out of service for a time and, likewise, giving a detailed final inspection of maintenance and repair work. Both should be done by some superior employee.

In reply to a question of what to do in case employees refuse to be finger-printed, Mr. Doherty stated that persistent refusal indicated such employee to be undesirable. In reply to another questioner who wished to know if F.B.I. might have some debilitating gas for guards and police to use in a manner similar to that in Radio's "Green Hornet," the answer was "not." Tear gas is of questionable value and the more effective gases are likely to "backfire." To another question—the reply was that authorities should frown on any activity to encourage plant visiting for the duration and that water supply plants should be treated as other plants making such essential defense material as is water—so, treat your visitors accordingly and not overlook the personnel survey.

Jordan on Operating Under Emergency Conditions and Priorities

Harry E. Jordan, Executive Secretary of A.W.W.A., came on fresh from Washington to review the newest developments in priorities and procurement of materials for water works operation and maintenance. He told of the nation-wide survey conducted by A.W.W.A. headquarters to provide a dependable estimate of materials and equipment to be required by water companies and water departments during the year. These figures had been of great value in arranging for water supply needs through the O.P.M. in Washington.

The squeeze in materials, metals in particular, had come about because of the National program to boost the 5 billion dollar defense program of 1940 to 35 billion in 1943. This meant a cut from 8 billion spent for civilian durable goods to 4 billion over the same 3 year period, and thus the necessity for regulating distribution by priorities in order to supply the most essential requirements first. Fortunately water supply and sewerage continue to be placed at the top of the essential civilian service industries and no operation has suffered any serious consequences to date.

"Round-Tablers"
George E. Lourie, Supt. of Water Bristol, Conn. (Water Works Inventories in Nat'l Defense)
William P. Melley, Supt. of Water Milton, Mass. (Financing Main Extensions)
Arthur C. King, Supt. of Water Taunton, Mass. (Water Rates to Industrial Users)

In order to secure a priority rating and a number, for stamping all orders for essential water supply and sewerage materials, a new form P. 46 issued September 17th must be properly filled out and filed. This new form supersedes the earlier PD-1 and P-22. Copies of form P.

Night-Hawks—Child's After the Ball
We will not attempt to name them all but call particular attention to the gentleman in lower left "shot" serenading the night-hawks on a mouth-organ—"Bill" Wickwire. Looking our way in the lower shot, second from right, is Mrs. Roger Esty, looking as charming as ever. "Bill" Melley lost his chin but Mrs. Bill (center in lower right shot) received better treatment, but Mrs. Don Calderwood (extreme right) just wouldn't look around. (Note—There has been a slip: the upper center shot was taken of a luncheon group in the Hotel Statler. Seems to be a Pittsburgh National Meter party, in which we recognize the N. J. Kennys, the Eben Lufkins and the R. H. Smiths)

46 had been promptly mailed to all members of A.W.W.A. and copies had been placed at the disposal of Secretary Gifford for the same use in N.E.W.W.A.

In discussing the phraseology of the P. 46 forms it was evident that replacement of equipment would be confined to necessity due to wear or damage—and, not because of obsolescence or to achieve higher offiiciencies. Further than this many would be required to use perhaps less durable goods than accustomed to under normal conditions. Minor extensions of mains and new customer service installations, including meters, were to be interpreted as maintenance and operation. On the other hand a major main extension and any completely new projects come in a different category and a Project Rating is to be required. In this case a carefully prepared brief, showing necessity, and a statement of all materials needed was a strict requirement.

Maurice A. Libby, Supt. of Water Bath, Maine
Thos. F. Wolfe, Executive Engr. Cast Iron Pipe Research Assn., Chicago
Roger G. Oakman, Supt. of Public Works Needham, Mass.

Mr. Jordan explaining the many changes in the O.P.M. scheme of handling public utilities, stated that he would endeavor to see that any project applications filed through the A.W.W.A. office would reach the proper authority of the moment.

A word of warning by Mr. Jordan indicated that overbuying was going to have to stop and, in this direction, all movements in the nature of maintaining control and pooled inventories of individual scattered stocks of water supply and sewerage equipment and materials was to prove a marked help in providing flexibility and exchange. He also mentioned the coming of a mandatory quarterly inventory which water works operators should get ready for.

Mr. Jordan was given a richly deserved vote of appreciation for the splendid job that he has been personally doing in Washington in behalf of the water supply industry.

Weston on Civilian Defense Organization

Arthur D. Weston, Chief Engineer, Massachusetts Department of Health, described the Massachusetts' organization and plan for civilian defense which constituted an amplification of an organization earlier established for functioning in disasters such as flood, hurricane, etc.

The Water Supply Plan, headed by Mr. Weston, involves the functioning of Water Supply Coordinators from amongst the water works managers in each zone and two coordinators on materials who represent the manufacturers. In case of disaster these coordinators automatically become members of the State Guard, with authority to issue orders. The job of the coordinators is that of determining the facilities existing and those required for providing more interconnection between water systems for emergency use. Data collected is being mapped for quick use in disaster. In addition coordinators are procuring detailed inventories which are filed as confidential in the State Health Department. Mr. Weston told of the plan of maintaining a small central stock of chemicals on consignment, which is being developed by Fred Gibbs of Wallace and Tiernan Company, with the sanction of O.P.M. as a Chemical Emergency Depot.

Roger Esty (Danvers, Mass.) one of the coordinators, with 31 cities of 10,000 pop. in his zone, told of the calling of district meetings of superintendents in his zone for the purpose of collecting inventory data and ascertaining equipment and material needs for the year or two ahead. All of this had dovetailed into the A.W.W.A. survey for O.P.M. use.

The Connecticut Plan

W. J. Scott, Chief Engr. of the Conn. Department of Health, told of the Connecticut Defense Plan in which a Water Supply Inventory Committee had been procuring valuable information for filing in the State Department of Health. This information included a confidential stock inventory and plans for system interconnections between adjacent communities, location of spare chlorinators, pumps, etc.

Nelson Boardman, Asst. Supt. Water and Sewerage Dept., Danvers, Mass.
Leonard W. Trager, Assoc. State San. Engr. N. H. Dept. of Health, Concord, N. H. (Secy. and Editor, N. Ham. W. Wks. Assn.)
Sidney S. Anthony, Supt. of Water Augusta, Maine (Editor, Maine Water Utilities Assn.)

A Disappointment

Many who had come with the expectancy of hearing the scheduled paper—"British Waterworks Practices in Time of War" were disappointed. The paper was to have been supplied by John Bowman, City Water Engineer of Edinburgh, Scotland, in collaboration with other British water engineers, but did not materialize.

Superintendents' Round Table

(Chairman—Roger W. Esty, Danvers, Mass.)

"Water Works Inventories in Relation to National Defense" was the topic introduced by G. E. Lourie, Supt. Water Department, Bristol, Conn., who told of the establishment of the Connecticut Water Works Association for the purpose of setting up an Inventory Committee. The plan had been very successful with confidential fillings of inventory of

A Few Shots of the Show at the Wednesday Evening Smoker and Exhibits in Part
(Booths pictured are those of Wallace & Tiernan; Builder's—Providence and Proportioneers; Pittsburgh, Des Moines; Dresser, and Limestone Products Corpn.—a newcomer. Other booth pictures will appear in our next issue.)

equipment and another of materials, with the State Health Department. Another list contained contractors' equipment and where located.

W. J. Scott, explained that these inventory lists were held confidential because of not wishing to penalize those utilities with foresight and good stocks of equipment. Acceptance of the plan was evidenced by the fact that all but two utilities in the State have come in. Mr. Scott, calling this the Mutual Assistant Inventory could see a decided advantage in keeping it going after the emergency.

Harry U. Fuller (Portland, Me.) in describing the Maine program of pooled inventory and zoning in respect to minimum needs for each zone, said that out of this might come standards for minimum inventories for utilities of various sizes to follow as their fair share.

At this point, S. S. Anthony, Editor, Maine Water Utilities, told of the circuit traveling Water Works Defense School of Maine, held in 5 central places and attended by 150. The school was financed by the Federal government. The 16 papers have been printed in booklet form by the Maine Water Utilities Association and are on sale at $1.00 per copy.

"Financing Water Mains"—by Wm. P. Melley, Supt. of Water, Milton, Mass.

In introducing this topic, Mr. Melley reviewed the popular methods of financing new water mains and for extensions as being: (1) bond sales; (2) surplus or reserves from water sales; (3) assessments against benefitting properties; (4) cash advanced by real estators and land developers. Mr. Melley pointed out that method (3) and (4) were admittedly sound because only those benefitting directly paid the costs. The other two methods were too general and also unfair to the water user having no benefits of property.

In financing mains and extensions, Mr. Melley was of the opinion, shared by many, that whatever part of the complete cost is for providing fire protection should come out of a different pocket from that which supplies the minimum required to provide a household supply. This different pocket should properly be a taxation on assessment pocket.

The President
with
Mrs. Leland Carlton
Springfield, Mass.

Mr. Melley had questionnaired a number of representative towns in the New England States, only to find wide differences in policy and various schedules of charges made to real-estate developers for extensions. For the most part minor extensions are paid for out of income and private companies follow the plan of making a 100 ft. extension per new customer without charge and employ the guarantee plan for longer distances.

Reviewing Milton's practice, Mr. Melley said that for the 17 years past extensions have been paid for through sale of bonds—but, cash retirement principle and interest were paid out of department income from water sales for a time. However, the "self-supporting" idea got bogged down soon after a heavy program of system reinforcements to improve fire protection got under way. To correct this situation the Town voted to tax itself $35.00 per hydrant as a fair means of paying for the betterments in town.

For extensions to new customers Milton's Board feels that a guarantee of 6% per year on the cost of installation for a period of 6 years should be ample. A cash deposit of ⅓ the cost must be deposited in a local savings bank to the order of the Water Dept. and represents practically the whole of the guarantee for the 6 year period. Of 40 more recent installations in new developments ⅓ were returning the required income after the first year and after the 3rd year only 15% had not sufficient revenues to cover the guarantee requirement. Regardless of the size pipe used the guarantor only pays for a six inch size. The Department installs all new services now, through from main to meter located in the basement, and adds a 25% profit charge or service charge to actual cost.

Mr. Melley, realizing that the Milton scheme might be short of being as good as desired, felt that it was in the right direction, with the combination of taxation (hydrant rental) and income from water sales (guaranteed return) and return from service installations spreading and equalizing the costs.

Abel Reynolds, Treasurer, New England Water, Light and Power Associates, of Providence, R. I. was called on by the Chair to tell how the several companies in his group financed extensions. Mr. Reynolds stated that extensions in City streets, or roads were made when receiving a guarantee of a gross annual return equal to 15% of the cost of installation for every year that the income from water sales on the extension does not reach the 15% minimum.

As to extensions in real estate developments such are made of sizes not less than 6 inches, provided the developer pay all costs and gives the water company permanent rights of way. The invested money is returned to the developer on the basis of ½ the gross revenue received each year from the extension—this period of reimbursement not to go beyond 10 years, or for a shorter period should the total refunds come up to the original investment. No interest is allowed on any part of the investment during the life of the unrepaid balance due the customer or developing company; and, some adequate form of surety is demanded plus prompt assignment of title to the property installed for the customer. If less than 6 inch mains are installed the company will not ordinarily take title or refund the investment.

Mr. Reynolds in reply to questions stated that the scheme had been em-

Arthur K. Akers
"Public Works"
New York
and
Mrs. Akers

Percy A. Shaw
Supt. of Water
Manchester, N. H.
and
Mrs. Shaw

Geo. C. Brehm
Supt. of Water
Amherst, Mass.
Mrs. Brehm and
Mrs. Paul Parker

Malcolm Pirnie
Consulting Engr.
New York
and
Mrs. Pirnie

Clinton Inglee
Natl. Water Main
Cl. Co., New York
and
Mrs. "Clint"

ployed since 1932, and the wise developers got the investment back through lot sales and whatever return was gotten back during the 10 years of 50-50 split of gross was just that much velvet. When an extension was added to one previously made the older customer received no benefits from the added income through the later extension. This, he admitted, was subject to some argument but there had been too little of this to constitute a problem.

Don Calderwood, Pennichuck Water Co., Nashua, N. H., reported charges of 6% guarantee for 5 year period as his company's requirement, charging the difference to good-will and happy public-relations in a small community.

T. L. Bristol, President, Ansonia (Conn.) Water Co., agreed considerably with Mr. Melley. In Connecticut Mr. Bristol collects 9.2 mills per inch foot of mains and $10.00 per hydrant. Even so when it comes to extensions 10% per year on the investment is the required guarantee for 10 years.

Jas. G. Gibson, Engr.-Mgr., Charleston, S. C., said that even 15% per year was too low a return. Actually to pro-rate the cost of the head-works, pumping, treatment, etc., to extensions would show nothing under 25% of the initial cost should be returned annually. With bonafide water users the City will make group contracts for extensions. Out of 50 now active only about 30% have failed to get all money back. In the low-rent fringes extensions of small pipes are run at no charge except for the service.

A. F. McAlary, Supt., Rockland (Me.) Water Co., reported that the Utilities Commission in Maine set the figure for them at 10% annual net return.

Concerning the Assessment Method

Leland G. Carlton, Supt. of Water, Springfield, Mass., said that $8.00 per year minimum bill per service pays for 50 ft of a 6 in. extension and anything above the average of 50 ft. per service must be paid at the rate of $20.00 per 100 ft. The Betterment Act of Springfield permits assessments for main extensions or sewerage. The assessment has the same status as any other real-estate tax, and is powerful therefore.

G. E. Lourie, Supt. of Water, Bristol, Conn., stated that the method has been used in Bristol for some time. The costs are guaranteed by the developer but at the same time becomes a special assessment against the property.

Chas. J. Crump, Engineer
Bourne Water Dis., Monument Beach, Mass.
E. T. Killam, Consulting Engineer
New York, N. Y.
Geo. G. Bean, Supt. of Water
Exeter, Mass.

Geo. Brehm, Mgr., Amherst Water District, Amherst, Mass. (former Amherst Water Co.), stated that Massachusetts had always avoided the assessment method to pay for anything. However, it was definitely the most logical way of paying for major improvements enjoyed by properties benefitting.

L. H. Enslow said that he would just wish to comment as an ordinary citizen sold on the fact that cast-iron pipe has a life of 100 to 200 years. Now, when using this long lived material it should be justified for the average citizen to want to know why Charleston wants to be completely paid for extensions in the first 4 years (i.e. the 25% Mr. Gibson recommends). That is a municipal plant too. Then others are from the language used and guarantees demanded getting paid twice for the extension in the guarantee period. While Mr. Enslow said that he was impressed with the published calculations as to the reason for the hypothetical high cost of extensions it would be interesting to know if the difference between actual local cost and supply system cost added was ever carefully held for the next needed expansion of the supply system. The main question was, however, how could such a rapid retirement be justified on an installation of such an expected pronounced longevity as cement lined C.I. pipes, modern hydrants and valves.

Water Charges to Industrial Users

This topic was introduced by Arthur C. King, Supt. of Water and Clerk of the Board, Taunton, Mass., who had made a survey of rates to large water users in New England. The accompanying table, which contains the rates, indicates that in the sliding scale rate three steps is prevailing practice. The most common low rate is 6 cts. per 100 c.f. and the most common 1st rate (high rate) is 15 cts. Several employ service charge or meter rental charge.

MUNICIPAL WATER CHARGES TO INDUSTRIAL USERS
By Arthur C. King, Supt., and Clerk of the Board of Water Works, Taunton, Mass. (Sept. 1941)

LOCALITY	Monthly Charge for 333,333 cu. ft.	Gravity or Pumped Supply	Number of Rates	First Rate in cents per 100 cu. ft.	Point of Change to 2nd Rate	Lowest Rate in Cents per 100 cu. ft.	Point of Change to Lowest Rate
Augusta, Me.	$208	G & P	7	20	333 c.f.	6	33,333 c.f.
Ayer, Mass.	379	..	3	41½	222	11¼	1,111
Brattleboro, Vt.	240	G	3	30	5,000	10	10,000
Bridgeport, Conn. ..	280	G	4	15	6,667	6	40,000
Burlington, Vt.	348	P	3	20	10,000	10	20,000
Concord, N. H.	200	G & P	10	16⅔	500	7	145,000
Fall River, Mass....	396	P	14	24	775	10½	217,000
Fitchburg, Mass. ...	141	G	3	18	1,667	4	18,333
Hartford, Conn.	307	G	2	15	93,000	7½	93,000
Holyoke, Mass.	142	G	1	4¼	....	4¼	....
Lynn, Mass.	405	..	3	15	16,667	8	416,667
Manchester, N. H...	197	P	3	10	33,333	5	100,000
Middleboro, Mass. ..	511	P	7	19	40,000	10	1,000,000
New Bedford, Mass.	259	P	5	11¼	3,300	1	666,600
New Haven, Conn...	390	G	7	50	200	5	750,000
Norwich, Conn.	211	G	3	25	1,667	6	16,667
Peabody, Mass.	490	..	2	15	300,000	12	300,000
Pittsfield, Mass.	202	G	3	12	1,667	6	5,000
Portland, Maine	248	G & P	4	14	10,000	7	30,000
Providence, R. I.....	267	G	3	18	3,333	7½	33,333
Salem, Mass.	500	..	1	15	....	15	.....
Springfield, Mass. ..	167	G	2	22	1,667	5	1,667
Taunton, Mass.	239	P	3	19	3,333	6¾	33,333
Westerly, R. I.	300	P	6	22½	2,060	7½	124,000
Woonsocket, R. I. ..	244	G & P	4	21	3,333	7	10,000
Worcester, Mass. ...	300	G	1	9	....	9	.....
AVERAGE	291	..	4	19⅓	23,423	7½	176,741

Wm. R. Schnabel
Supt. of Water
Allentown, Pa.

"Ed" D. Case, Pres.
Pitometer Co.
New York

Lloyd Nelson
U. S. Pipe & Fdy. Co., Philadelphia

John H. Robinson
Supt. Wt'r & Sew.
Concord, Mass.
and
James Clahane
Asst. Supt.
Concord, Mass.

Sidney G. Beane
Supt.
Weymouth, Mass.

Jas. O. Jordan
Hedge & Matheis Co., Boston

Harry W. Dotten
Supt. Wt'r & Sew.
Winchester, Mass.

W. H. Johnson
Phoenix Meter Co.
Staten Island, N. Y.
and
Henry Ibbetson
Supt. of Water
No. Tiverton, R. I.

J. W. Wickwire
Edson Corp.
Boston

John W. Hughes
Supt.
Harwich, Mass.

H. W. Jacobs, Pres.
Pub. Wks. Sup. Co.
East Lynn, Mass.

At Ansonia, Conn., T. L. Bristol stated, the service charges are based on meter sizes $2.25 for ¾ in. and upwards. Where several meters are installed and desired by the industry each is treated as a separate account and readings are not pooled. They employ the Commission's Rate Structure at Ansonia.

In discussing the difference between minimum charge and service charge which came up, Roger Esty said that the theory behind metering was not to allow for wasting of any water, whereas the minimum charge unless on a ridiculously low quantity would permit waste without the smaller customers knowing about it—i.e., the great numbers. The service charge which pays the service cost, and nothing allowed for water, seems far the more logical. To back up his contention Mr. Esty revealed a study of 120 services (506 people) which indicated the average annual use of water to be 4.29 cu. ft. per capita (33¼ gals.) only at a cost of less than 1 cent a person a day. In Danvers actually the average customer pays less than $12.00 per year, including a service charge of $4.80. This is probably the answer to the conservative 32 gals. per capita per day water use in Danvers which Mr. Esty believes to be enough when one comes right down to cleanliness and sanitation as the measuring sticks of what's needed.

In defense of New Bedford's minimum rate of under 1 cent, Stephen H. Taylor said that it was drawn by the Board which reasoned that the only cost of that water was the extra coal required to pump it. Only 3 consumers got down to that rate, the average being nearer 4 cts. If the plants of one company run contiguously, the meter readings are grouped or pooled to give the minimum rate.

Wm. Naylor, Supt., Maynard, Mass., also pools water meter readings in various parts of one plant.

Harry N. Fuller, Chief Engr. P.W.D., Portland, Me., in first discussing extension costs and charges said that the most that the District could figure was 12% as the annual charge for extensions. Actually they charged 10% and felt that perhaps it was enough under the District's conditions.

In regard rates they allow 6,000 cu. ft. per quarter at the minimum rate of $5.00 per quarter. They have block rates but no special industrial rates. Mr. Fuller backed up Mr. Esty's statement that the minimum rate was basically wrong and service charge is basically right. Since facts show that the minimum gallonage allowed is rarely ever used through so many services, the trend is expected to be in the direction of the more logical service charge.

Don Calderwood, Nashua, N. H., in speaking out for the small community private company was of the opinion that a whole lot could be wrong with the method of charging for water and service before the water company should create the considerable disturbance which changes in rate structures always bring about.

Magic in Pittsburgh-National's Suite

"Assistant magicians" (center) are Mathieson Alkali's Jack Carey and Howard Potter, Engr., Maine Utilities Commission, Augusta

The Chemist's Round Table

(As Reported by "Spec" Hale, Chairman)

Will be run in our November issue. In addition, other papers which dealt with water quality and treatment, will be abstracted for the same section.—ED.

Boston Water and Fire Department Demonstrations

(1) and (2)—Much interest was shown in Boston's new emergency and defense pumpers consisting of gasoline engine powered fire pumps mounted on two-wheel trailer trucks. (3)—Daniel M. Sullivan, Deputy Commissioner, Dept. of Public Works, Boston. (4)—Geo. S. Ryan, Leak Detection Engr., Boston Water Dept., demonstrates leak-location with a radio type leak-locator. (5)—Mr. Ryan explains the method and pattern followed in Boston's leak-location work.

WATER AND SEWAGE PATENTS

(Of Recent Issue)

Reported by

JULIAN F. SMITH
ASSOCIATE DIRECTOR
Hooker Scientific Library, Center College
FAYETTE, MO.

This page constitutes a service added this year for the benefit of readers of WATER WORKS AND SEWERAGE, *many of whom are interested in keeping informed as to what is new in the way of patents issued in the water, sewage and allied fields.*

It is proposed to print these patent abstracts in alternate issues, or more frequently if the number becoming available justifies. This service began with our March, 1941, issue.

Water Patents

Automatic Purifier Control. F. G. Merckel (to Wallace & Tiernan Products, Inc.). U. S. 2,251,149, July 29. In treating raw water with a chemical a photoelectric cell is used to adjust the rate of flow through the purifier according to the clarity of the effluent.

Anion Exchange Resin. R. C. Swain (to American Cyanamid Co.). U. S. 2,251,234, July 29. Using an insoluble anion-active biguanide-aldehyde resin for removing anions from a liquid.

Zeolite Regeneration. E. J. Culligan (to Culligan Zeolite Co.). U. S. 2,252,065, Aug. 12. Portable zeolite tanks are regenerated by connecting them in series and pumping sufficient brine through the system to regenerate all the zeolite, allowing some excess for the last tank.

Pumping Water. Willoughby F. Hollister. U. S. 2,252,597, Aug. 12. A well pump has a water cylinder partitioned into a water receiving chamber and a water discharge chamber, and an inner cylinder in which a double-acting piston is operated by a pump rod.

Treating Aquarium Water. Jas F. Haldeman. U. S. 2,253,516, Aug. 26. A pump and filter for regenerating used aquarium water.

Base Exchange Reagent. Bruno Montero (to Investo Co., Inc.). U. S. 2,253,722, Aug. 26. Making an artificial base exchange composition by adding sodium chloride and sodium silicate to a saturated aqueous solution of aluminum sulphate.

Algicide. T. S. Carswell and H. K. Nason (to Monsanto Chemical Co.). U. S. 2,253,762, Aug. 26. A reagent for control of algae, protozoa and slime growth comprises a water-soluble derivative of a polyhalogenated monocyclic phenol.

Water Tester. Arthur L. Riche. U. S. 2,254,782, Sept. 2. A tester for water and other liquids has a cylindrical observation cell with opposite windows through which a beam of light is passed for opacity or turbidity measurements.

Pump Assembly. Knut E. Lundin (to Radial Pump & Compressor Co.). U. S. 2,255,851-2, Sept. 16. Pumping device having a star-shaped lower water chamber, above it a similar air chamber with its arms alternating with those of the water chamber, and a piston pump above the air chamber with its pistons also in a star-shaped arrangement.

Boiler Water System. John Amen. U. S. 2,256,511, Sept. 23. The supply tank of a boiler feed water system has a float-controlled mechanism for taking water from a main supply source and delivering water to the boiler according to the liquid level in the boiler.

(S) Clarifier. Miguel Arango (to Petree and Dorr Engineers, Inc.). U. S. 2,253,500, Aug. 26. A tray clarifier with liquid inlets to successive compartments, and a central discharge opening for settled solids.

(S) Clarifier. Wm. C. Weber (to Dorr Co., Inc.). U. S. 2,253,878, Aug. 26. A tray clarifier having horizontal partitions forming compartments with central openings through which a vertical rotating column passes, and means for moving settled solids toward the center.

(S) Clarifier. A. J. Fischer (to Dorr Co., Inc.). U. S. 2,254,176, Aug. 26. A tank with a flocculation zone and a settling zone which is partitioned into an upper and a lower settling chamber.

(S) Items having application in the Sewage Field also.

Sewage Patents

Sewer Cartridge. Arthur P. Taber. U. S. 2,251,080, July 29. Chemicals for clearing an obstruction in a sewer pipe are placed in a non-waterproof cartridge having projections which catch on the obstruction and hold the cartridge in place till the chemical is released.

Sewage Disposal. Howard S. Thomas. U. S. 2,254,953, Sept. 2. In an activated sludge plant the primary sludge is passed to an aeration tank having intercommunicating compartments in which sludge may be stored for a time prior to final disposal.

Sewage Distributor. Robert O. Friend, J. A. Montgomery and Wm. F. Schaller. U. S. 2,255,157, Sept. 9. A device for distributing water or sewage evenly over a filter bed has a feed pipe open at the top, with a distributor disk revolving around it where the liquid emerges from the pipe.

Sewer Cleaner. John C. Miller. U. S. 2,255,800, Sept. 16. A self-adjusting rotating cutter for cleaning obstructions from sewers and drain pipes.

SEWAGE FEDERATION CONVENTION CROWNED BY SUCCESS

Friendly Spirit of Second Annual Meeting Reflected in Papers, Exhibits and Powwow.

By HARRY A. FABER*
Associate Editor

THE second annual convention of the Federation of Sewage Works Associations was held in New York City on October 9th, 10th and 11th, in conjunction with the fall meeting of the New York State Sewage Works Association. This simple statement is for the record, but it reveals nothing of the planning and hard work which the convention represented. For all those who attended, however, the meeting has become three days to be long remembered.

Chas. A. Emerson
Retiring President
[Made Federations 1st Honorary Member]

A. S. Bedell
New President
[Did real job of Convention Management]

A registered attendance of 569 members and guests topped the official count of 555 attending the first convention in Chicago. The technical program was filled with practical papers and with down-to-earth discussions; the entertainment provided for the social side of the meeting; and every spare bit of time was put to good use in learning from exhibits and from "the other fellow" what was new or helpful. If the prime purpose of an association is "to associate," then nothing was left to be desired.

Every one of the convention committees did its job well, and each deserves high praise for the time and effort contributed to the successful result. Nothing testifies more accurately to the health of an organization than the sincere interest of its officers and of its members. There is ample evidence that such interest, and hard work as well, is present in ample degree in the Federation.

*Research Chemist, The Chlorine Institute, Inc.

First Day

Actually, the convention began even before its official opening, with an informal "Get-Together" on Wednesday evening, sponsored by the Convention Management Committee. Some eighty early arrivals congregated to meet old friends and to make new ones, to sip beer and eat pretzels and popcorn in congenial company, and to start the meeting rolling in true friendly spirit. President Emerson and Vice-President Bedell, as well as many other officials, were on hand to greet all comers.

On Thursday morning Prof. Eliassen's registration committee started the good work which it continued throughout. Executive Secretary Wisely was much in evidence, "moving rapidly in all directions." An impressive array of manufacturers' exhibits met the eyes of each member arriving to register, or in wending his way to the technical sessions thereafter.

In the evening men congregated in force at the stag smoker where clever entertainers provided their share of the convivial spirits. This day, of course, ended at different times for different individuals: no record is kept of the "office-hours" held in manufacturer's rooms, of the bridge or poker games under way, or of other after-dark diversions.

Second Day

On Friday, after hearing papers on plant operation and after participating in a plant control and operation symposium, members filled to near capacity the Pennsylvania Hotel Roof Garden. This informal dinner dance was the final social event of the meeting and typified the good fellowship characteristic of the entire convention. Entertainment of unusually high quality, good music, and good food left everyone satisfied.

Geo. J. Schroepfer
Minneapolis
(Elected Vice-Pres.)

W. H. Wisely
Champaign, Ill.
(Exec. Secretary)

Third Day

On Saturday, the Operator's Breakfast started the day by bringing together all those—and there were many—who wished to take part or to listen in on the "Operator's Turn Table." Under Messrs. Van Kleeck and Poole, this provided opportunity for anyone to talk or ask questions on grit disposal, safety, housekeeping, and whatever else might be his most difficult problem.

This was followed by a brief business meeting at which various committee chairmen presented reports. Then members adjourned to a buffet luncheon, where regional groups held forth. Assistant Secretary Eustance, of the New York Association, presented statistics on man-miles traveled by sectional groups to the convention, and "Bill" Orchard—by means of a heads-or-tails elimination—collected the nucleus of a fund to purchase a prize which will be

The Retiring President and Mrs. Emerson of East Orange, N. J.

President of the N. Y. Sewage Wks. Assoc. H. H. Wagenhalls and Mrs. W. of Syracuse, N. Y.

"Doc" Mohlman, Journal Editor, and Mrs. Mohlman, of Chicago.

awarded each year to that section being represented at the convention by the most man-miles.

Finally, members were taken by chartered busses to inspect the Bowery Bay Sewage Treatment Plant of New York City, where secondary treatment units are under construction.

(An unscheduled item on this inspection was the spectacular arrival of one of the Clipper ships from Lisbon. The landing of these trans-Atlantic "birds" is right next door to the Bowery Bay Plant.)

Business Meeting of the Federation

At the business meeting, President Emerson reviewed developments and progress made by the Federation during the past year and mentioned his hopes for the future. Executive Secretary Wisely described the healthy condition of the Association, with special reference to the last few important months, during which headquarters offices have been moved to Urbana, Ill. The Federation has been incorporated under Illinois laws as a non-profit organization, and all possible member service is now given by the Secretary with the aid of one full time and one part time assistant. Mr. Wisely expressed appreciation for contributions to the new "Operators' Corner" in the Journal and solicited further cooperation in this very useful development.

A number of brief committee reports were received at this meeting. George Schroepfer, Vice-Chairman of the General Policy Committee, mentioned several of the aims under consideration by this committee. Among others these include: recognition for meritorious papers, by awards named in honor of outstanding Federation members; certificates for superior operation reports, as an aid to public relations; and the determination of qualifications for operators.

Under F. W. Gilcreas, Chairman, the Publications Committee has devoted most of its work to preparation of the convention program and to developing the editorial policy of *Sewage Works Journal.* Chairman F. W. Mohlman* of the Sewage Works Practice Committee, described this as a "supervisory" group which will consider proposed standards, study plant operating costs and sewage treatment service charges. He noted that the number of text pages in the Journal has increased each year recently, and that a larger number of pages is also being devoted to material of interest to operators.

Recognition Given to President Emerson

As a fitting conclusion to the business session, "Bill" Orchard gave a well-merited tribute to retiring President Emerson. The volume of work, correspondence, reports, and committee meetings carried on by him well deserve recognition. Most of all, he deserves credit for keeping the welfare of operators foremost in all plans and considerations. Amidst merited applause, "Bill" presented to "Charlie" Emerson a gold wrist watch engraved:

"Presented to C. A. Emerson in recognition of devoted service."

This gift represents contributions from many friends who are aware of the time and effort "Charlie" has unstintingly contributed to the Federation.

At the close of his term as President, the Board of Control decided that it was fitting to make Mr. Emerson the first honorary member of the Federation and such was done by unanimous vote of the Board with acclamation and a vote of appreciation to one who has worked so long in the interest of the Federation.

Quarter Century Operators' Club

Proudly in evidence during the meeting were badges worn with a bright red packing ribbon—just a few of them—and soon everyone learned that their owners comprised the "Quarter Century Operators' Club." Mainspring of this unique organization is Frank Woodbury Jones, Consulting Engineer, who stated that perhaps twenty out of the entire Federation membership were qualified to belong to the Club; of these eight were present at the convention. Membership is limited to those who were operating or asssisting in the operation of a sewage treatment plant prior to October 1, 1916. Dean of all is Julius Bugbee, who started his period of service at the Worcester, Mass., plant and who has been located at the treatment plant at Providence, R. I., for forty years. The roster of those honored at the convention by becoming charter members is:

Julius W. Bugbee, Providence.
Stuart E. Coburn, Boston.
John Downes, Plainfield, N. J.
Chas. C. Hommon, Canton, Ohio.
Frank Woodbury Jones, Cleveland.
Roy Lamphear, Worcester, Mass.
Paul Molitor, Sr., Madison-Chatham, N. J.
Bill Piatt, Durham, N. C.

*New chairman is Morris M. Cohn, Schenectady, N. Y.

2nd Annual Dinner-Dance:

New York Atmosphere For the Ladies

With their committee functioning as smoothly as all others at the convention, the ladies were provided with entertainment possible only in New York. Under Mrs. C. A. Emerson as Honorary Chairman, Mrs. Karl Mann as Chairman, and with eleven members of their committee, their functions included: On Thursday, a luncheon at the Town Hall club, followed by a visit to Radio City; on Friday, a tea and Fashion Show staged for the group at James McCreery & Co.; and finally, on Friday evening, the high-spot of convention entertainment, the Federation Dinner Dance.

Convention Begins with Record Membership

President Emerson set the stage for the second Federation convention by citing facts and figures which attested to the progress in Association affairs. Despite the fact that only one previous convention has been held, the organization is nearly fourteen years old. During its existence, the total membership in those associations which compose the Federation has grown to an all-time high of 2,835.

In particular, the past year has been a busy and significant one, with the establishment of a central office under Secretary Wisely, new classifications of membership, and the clarification of both business and editorial policies of Sewage Works Journal. President Emerson called attention to the sound financial condition of the Federation, as well as to the excellent ground work which has now been completed as a basis for still further expansion of the Federation. To the many officers, committee chairmen and members who had contributed their time and efforts to this progress he expressed sincere appreciation.

Federation Warmly Welcomed by Commissioner Huie

Hon. Irving V. A. Huie, Commissioner, Dept. of Public Works, brought greetings from the City of New York to everyone attending the convention. His timely and practical remarks provided the proper foreword to the technical program. Public welfare, public health, and the advancement of commerce, he pointed out, depend largely upon the accomplishments of engineers and scientists. All such accomplishments are the outcome of hard work, but hard work is recognized as the daily diet of these two specialists.

As an example of municipal progress, he reviewed the imposing program undertaken ten years ago by New York City to dispose of the nearly one billion daily gallons of sewage discharged. This program has resulted in the construction of four large modern treatment plants which now handle over one-third of the city's sewage. Before these plants were built, a few scattered and inefficient treated about 12 per cent of the sewage flow; but while the quantity treated has now increased three times, by better treatment in addition, the actual pollution removed is 20 times greater.

Because of the primary importance of defense needs, construction of new municipal projects will necessarily be curtailed. During the present, however, much can be planned for the future: design of needed projects, preliminary studies and surveys, will do much to take up the slack in construction. Likewise, much study is now desirable with reference to improvements in economy and efficiency of existing municipal services.

Technical Papers

"Operating Experiences in New York City," by Richard H. Gould, Acting Deputy Commissioner, Department of Public Works, New York City.

In his thorough and extensive paper, Mr. Gould presented facts as to what New York City is trying to accomplish, what it is now doing, the results and the difficulties experienced, and general plans for the future. While the tools used are common to all municipalities, there are two conditions which control the type of sewage treatment works built and in operation in New York: (1) The plants have no isolation. They must be located in congested areas close to large groups of people. Therefore, they must be operated to neither produce offensive odors nor be unsightly. (2) Most major plants are accessible to tidewater. Thus, they have available a cheap and efficient method of sludge disposal.

For these reasons and others, the policy has been to provide sludge digestion, with utilization of gas for power; to adopt seasonal degrees of treatment, and, in general, to search for efficient and short time treatment methods that can largely be operated by the power produced.

The bulk of New York City's sludge is a mixture of raw and activated from the Wards Island plant.

Sewage Works Federation Convention

In 1940 the three 1,500 ton Diesel operated vessels disposed of sewage solids for a total operating and maintenance cost of $1.88 per m.g. of sewage treated, or $2.40 per ton of dry solids. (For the full story of sludge barging by New York and other cities, see WATER WORKS AND SEWERAGE, September, 1941.—Ed.) The dumping area is eleven miles from land, and no offense is created as the sludge quickly disappears.

Handling of the raw sludge, however, constitutes the real problem. There are sludge storage tanks at the Wards Island plant having a total capacity of 188,000 cu. ft., and enclosed in a building to retain the terrific odors produced. Air and gases ventilated from this building are drawn through activated carbon filters at a rate of 15,000 c.f.m., and ozone is applied at a rate of 40 to 60 grams per hour. While no quantitative method of measuring proportional odor removal is available, it is estimated that the filters may remove 80 to 90 per cent, depending on effective capacity. The two methods —adsorption and oxidation—give adequate control.

Sludge digestion has been adopted because sea disposal depends, for economy, on large individual shipments. In smaller plants, storage of raw sludge would create considerable offense while accumulating ship loads, and some plants are also restricted by winter ice. Another consideration is the reduction of sludge volume obtained by digestion. The Coney Island, Tallmans Island, and Bowery Bay plants now operate digestors, with considerable reduction in operating charges resulting from the utilization of sludge gas. (The new Jamaica plant also is provided with sludge digestion.—Ed.)

At Coney Island, eight digestors handle chemically precipitated sludge in the summer months and plain settled sludge during the winter. Each digester has a gasometer type cover which provides gas storage to the extent of 45 per cent of the digester capacity. (The same type is used at Bowery Bay and Jamaica plants.) Only source of power at the Coney Island plant are the gas engine operated generators, and for the past three years it has been necessary to purchase only 0.85 per cent of the total gas required for both engine operation and heating. The digested sludge is barged to lagoons on an undeveloped park area, dried, and removed for use by the Park Department. At Tallmans Island, digestors are equipped with Downes type floating covers and have no gas storage. About 1.5 per cent of the gas required at this plant is purchased.

Hosts and Distinguished Visitor

H. Liebman, Engr. of Design (left) and Dan Hogan, Supt. Bowery Bay Plant (right), N. Y. City Dept. of Public Wks. In the center, Wellington Donaldson, Director of Sewage Disposal, N. Y. City, and Langdon Pierce, San. Engr., Chicago Sanitary District.

Treating about 40 m.g.d., the Jamaica and Hammels plants utilize fine screening. These screenings are centrifuged to a cake of 65 per cent moisture and the cake is converted to an inoffensive and useful fertilizer. As the cake leaves the centrifuge, gypsum (2 per cent by weight) and straw (2 per cent by volume) are mixed with it. This mixture is piled on the ground and the composting temperature soon reaches 150° F.; after approximately one month the material can be used. It becomes chocolate brown in color, has an inoffensive odor, is loose in texture, and resembles a high grade natural humus or peat moss. Analysis shows 80 per cent organic, 2.5 per cent nitrogen, and 1 per cent phosphoric acid as average analytical figures. In 1940 some 1,600 tons of screenings were thus treated, all being used by the Park Department as mulch around trees and shrubs.

F. W. Gilcreas
(Albany)
Chairman, Publications Committee

Morris M. Cohn
(Schnectady)
Chairman Sewage Wks. Practice

Treatment by the activated sludge process is required throughout the year at those locations where the concentration of pollution must be reduced by more than primary and chemical treatment. By such treatment consistent removals of 90 to 95 per cent B.O.D. and suspended solids are secured, even with sudden variations in load. At the Wards Island plant, for example, the raw B.O.D. commonly jumps from 1,000 lb. per hr. at 8 A. M. to 8,000 lb. per hr. at noon.

The Wards Island plant is rated at 180 m.g.d., but in July, 1941, the flow averaged 217 m.g.d. The Tallmans Island plant is still underloaded but has experienced serious trouble from heavy discharges of oil and dye wastes. Yet the average yearly removals at this plant during 1940 were, B.O.D. 87 per cent, and suspended solids 91 per cent. Reduction in total bacteria at the Wards Island plant was 98 per cent and at the Tallmans Island plant 99 per cent.

Step aeration, employed at the Tallmans Island plant, has provided desired flexibility since the settled raw sewage can be added to the aeration tanks in each of three progressive steps or conventional aeration may be used (and is), according to conditions. Comparative studies of step and conventional aeration are underway at the Wards Island plant, using a 20 m.g.d. pilot plant. Preliminary results appear to confirm the early expectations of "step-aeration." [Prof. Fair later refers to the method as "Incremental Loading" in contrast to variations in air feeding.]

Chemical treatment has been used on a seasonal basis at Coney Island since 1936. From the middle of June until the middle of September, iron salts are used for coagulation, and chlorine is used for disinfection. Chlorine is used also for a few weeks before and after this period to accomplish odor control by partial satisfaction of the chlorine demand. The dose of coagulant applied is only that sufficient to secure an effluent no higher than 50 p.p.m. in turbidity.

Mr. Gould described studies of chlorinated copperas and of ferric sulfate, both with and without lime, as coagulants at the Coney Island plant. In 1938, '39 and '40, chlorinated copperas was the coagulant selected,—based on an overall picture of cost, efficiency, and ease of handling. In 1941 a favorable price on ferric sulfate resulted in this chemical again being used. Experience has shown that ferric salts and lime can not both be handled in the same airveyor system because of reactions which occur between remaining ves-

FROM THE ORIGINAL PAINTING ESPECIALLY MADE FOR NIAGARA ALKALI COMPANY

TWO THREADS of yarn, if wound together correctly, usually possess greater strength than the sum total of both separately. With just such a result have the resources of the Niagara Alkali Company and Electro Bleaching Gas Company been combined. For more than three decades these two familiar names have represented services of a similar nature and they have served many industries well. Now they are united into *one* compact, strong, closely integrated organization which, because of the combination of manufacturing, research and personnel facilities, can serve customers of *both* better than *each* could separately. The organization is now known as the NIAGARA ALKALI COMPANY.

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tiges of iron or lime and consequent binding in gates or equipment.

The removals obtained during 1940, using chlorinated copperas as the coagulant, were given as: 77 per cent suspended solids and 61 per cent B.O.D. during chemical precipitation, 51 per cent suspended solids and 27 per cent B.O.D. during plain sedimentation. Total chemical cost was $5.20 per m.g. and was divided as follows: copperas and chlorine (223 lb. per m.g.), $2.07; chlorine for disinfection, $3.13.

Not the least of the problems confronting municipal authorities, said Mr. Gould, in conclusion, is the securing of funds for construction and proper maintenance of plants. Especially in large cities, obtaining proper personnel and providing general administrative control constitute real limitations. In New York City it can be said that operating efficiency is either improving or is at a high level and operating costs are showing downward trend.

"Design of Sewage Treatment Plants to Facilitate Operation," by Stuart E. Coburn, Chemist, Metcalf and Eddy, Consulting Engineers, Boston, Mass.

Too often, according to Mr. Coburn, experience has shown that both designers and operators of sewage treatment plants forget that the objective to be attained is "removal of impurities at the least cost consistent with securing the requsite degree of treatment." Improvements and additions should be made through consultation between designer and operator cooperating in cautious progress. They should not venture too far upon untried, uncharted courses. Obviously plant design will be determined by the degree of purification required and will depend upon such factors as flow of the receiving stream, recreational use of the water, State or Federal requirements, the presence of industrial wastes, as well as available locations.

There are three major essentials of design which make for peace of the operator: simplicity, flexibility, and convenience. Each increase in complexity increases the number of points at which trouble may occur. Flexibility is dependent upon duplication of units or upon alternate methods of accomplishing the same results. It is particularly essential where mechanical units, subject to breakdown are involved. Convenience means accessibility, ease of lubrication, adequate lighting, compactness, and protection from inclement weather.

Watch Presentation to President

Scene I—Bill Orchard dramatically tosses a dollar-ticker from Charlie Emmerson's pocket to Paul Molitor, Sr., Dean of N. J. Operators.

Scene II—Substituting a handsome watch presented to the retiring president by 50 friends in the Federation.

There are minor features—many of them—which a designer can frequently learn by listening to the man who operates a plant: cleanliness is vastly aided by mechanization, many improvements remain to be made in tank inlets and outlets, and provision should be made for fly control on filters. Clogging of sludge pumps is a problem that needs more attention, and safety devices and equipment should be more generally provided.

Mr. Coburn reviewed many examples of instances of such desirable improvements, observed in his long contact with operating plants. He emphasized simplification wherever possible to lighten the task of operators—unless "this might mean less pay for the latter, which would never do!"

Discussion of this paper was presented by Morris M. Cohn, Sanitary Engineer, City of Schenectady, N. Y. He pointed out the natural antipathy between designers and operators when the former say, "Ideas won't work unless you do." But the operators, in return, say "It's a poor idea which won't work when we work our heads off!" The basic question a designer should ask himself is: "Could I operate every unit and portion of this plant myself?" Of course, vision is required to see problems of operation during the planning stage, but there are evident gratifying trends toward designing with operation foremost in mind. Another trend which should be more widely adopted is that of the designer's responsibility for operating the new plant during its first and most trying year. Facility of operation does not lessen the operator's responsibility, and operation of a sewage treatment plant will always be measured by the man on the job.

The Man Who Had to Operate What He Designed and Built

In looking about the room for an impromptu discussion, Chairman Wagenhall's eye lit on a somewhat rare and hard to catch (or to make talk) bird in the form of the plant designer who has been given over the job of operating his own plants. Said the chair—will Mr. R. M. Dixon, Supt. of the Dallas, Tex., Plant, who designed said plant, please tell of the extent to which "Dixon and Dixon—Designers and Operators" remained on speaking terms at Dallas, after the exciting first blast through the plant of everything from muskmellons to mattresses. With dry humor Mr. Dallas-Dixon told of some laughable things that happened but for the most part nothing of major defects had been found since learning that supernatant liquor might be most anything and that recirculation of plant effluent had remarkable effects on correcting odors and flys. With operation in mind motors were placed on every valve of any size (77 in all) and other considerations had seeming resulted in a happy operating force. While time didn't permit it we are of the opinion that even Mr. Dixon will admit that the second plant would have even fewer bugs than No. 1.

Stranger yet is the fact that Mr. Dixon, when working for the State Dept. of Health, sold Dallas authori-

The Warren J. Scotts of Hartford, Conn.

The C. C. Larsons of Springfield, Ill. ("Sweed" is Past-Pres. of Central States Assn.)

Host Richard Gould, Chief Engr. and Deputy Commissioner of Works, N. Y. City, and Mrs. Gould.

Secretary Homer Wisely and Mrs. W. from Champaign-Urbana, Ill.

Norman C. Wittwer, Cons. Engr. of Trenton, N. J., and Mrs. Wittwer.

Sam Probasco, City Engr. Burlington, N. J., (President of the N. J. Assn.) and J. W. Van Atta, Sales Mgr. Ralph B. Carter Co., N. Y. City

"Bill" Sylvester Engineer Asst. to the Commissioner, N. Y. City, explains some of the interesting features at Bowery Bay.

Wm. Raisch, Cons. Engineer, New York and Webster Caye Contractor on Bowery Bay plant.

Ralph E. Fuhrman, Asst. Sup't. Washington, D. C., and Miss Gladys Swope Chemist in Charge Sewage Treatment Highland Park, Ill.

Paul Molitor, Jr., Supt. of Sewerage, Morristown, N. J. and Mrs. Paul.

ties the idea of building the plant.

"Industrial Wastes, the Law, and Pollution Control Programs," by Milton P. Adams, Executive Secretary Engineer, Stream Control Commission, Lansing, Michigan.

An era of unprecedented construction in the field of industrial waste treatment plants has been closed by National Defense production. Many varied problems still remain unsolved, however, particularly in the "wet" industries which depend for their existence upon relatively large quantities of process water.

Mr. Adams discussed the outstanding progress made up to the present in Michigan and in other states, noting that a much enlarged and continuing function both supervisory and administrative is required if real pollution control is to result. Experience has proved that major industrial problems diminish or disappear in proportion to the supervisory staff effort which is devoted to the task.

Making of summary orders and their enforcement has seldom been found satisfactory, especially when methods or means of correcting the condition are unknown or currently unattainable. It is neither a sound public policy nor is such action likely to be sustained in the courts.

In Mr. Adam's opinion, more restrictive State or Federal legislation is unlikely within the coming decade. But he asked, "Are we making the best use of the laws which we already possess?" He pointed out that pollution abatement is only one part of a larger problem: the wise use of water resources, without abuse, is one of the accepted definitions of good conservation. It is also a fair statement of principle to be drawn from the common or court-made law.

This declared policy of the "common law of waters" will provide sound administrative guides to practically every situation that can conceivably arise. Usually the common law is invoked by filing a bill to enjoin detrimental pollution. What is sought is "reasonable use" by the polluter, obtained through the court's decision. Such cases are heard in a court of equity or chancery as distinguished from a court of law.

This policy, followed in contacts with industries and municipalities in Michigan, has yielded results and generally effective cooperation. Good will cannot be overestimated in accomplishing control of pollution. No State or Federal agency can ever employ sufficient pollution policemen. The author read a number of quotations from applicable paragraphs of the so-called "common law of waters" which obviously are entirely applicable to prevention of stream pollution. He concluded that the awaiting of Federal law enactment seems entirely unnecessary in order to make further progress in pollution control.

C. R. Hoover, Hall Laboratory of Chemistry, Wesleyan University, Middletown, Connecticut, discussed Mr. Adams' paper, saying that it presented an invigorating and practical legal justification for the extension and improvement of industrial waste pollution control. From the standpoint of the industry, pretreatment and waste elimination should definitely be under active consideration at the present time: more drastic competition is to be expected in the post war period, and now appears to be the best time to look toward avoiding every possible expense in the coming period of depressed business.

Industrial chemists and engineers require better appreciation of sanitary engineering and of the effect small amounts of toxic substances have upon biological processes. Many economies in manufacturing can be pointed out, and recoveries—especially those of strategic materials—can now be emphasized to advantage. Full use should be made of the many new municipal sewage treatment plants for handling all industrial wastes that can safely be admitted. In this way both public health and the health of industry will be benefited.

This report will be continued in our November issue. We are indeed fortunate in having Mr. Faber available to prepare this report while Ye Ed is nursing something which seems more than a common cold. We would say that this particular one is "d——— common." Maybe its amongst those things one may expect to pick up on Bowery Bays on a chilly and blowy afternoon without benefit of top coat. In any event it has turned out to be a darned costly experiment to us.—L. H. E.

"Johnnie" Horgan of Ralph B. Carter Co., and the petite "Mrs. Johnnie."

Newell S. Nussbaumer, Cons. Engr. of Buffalo, and Mrs. "N. S." Ed. Savage on right.

The Convention Bride and Groom. Mr. and Mrs. Carl D. Gross of Springfield, Ill.

Prof. Rolf Eliassen, N. Y. University, and his attractive dancing partner, Miss Mary Hulick.

"Doc" Geo. E. Symons, No. 1 Chemist, Buffalo Sewer Authority, and Mrs. "Doc."

MILK WASTE TREATMENT BY THE MALLORY PROCESS

Experiences at the Eachus Dairies Plant, West Chester, Pa.

By E. F. ELDRIDGE
Research Associate
Engineering Experiment Station
MICHIGAN STATE COLLEGE
EAST LANSING, MICHIGAN

THE WASTE treatment plant located at the Eachus Dairies at West Chester, Pa., is the first full-scale installation for industrial waste treatment in which the "Mallory Process" is employed.

The term "Mallory Process" is employed by the author to designate the waste treatment processes developed by Mr. E. B. Mallory and designed and installed by the Research Laboratories, Division of the Lancaster Iron Works, at Hackensack, N. J. The process may consist of several stages, the major one of which is the "Oxidized Sludge Process." In brief, it is the conventional activated sludge process under precise mathematical design and control.

Activated sludge has not often been successfully used as a method for industrial waste treatment, principally because the methods of control applied to the process have not been adequate to accommodate the wide variation which occurs in industrial waste loadings. The mathematical method of control, conceived and developed by Mallory, apparently removes all of the "guess-work" which has previously inhibited the application of the activated sludge process to industrial wastes and permits its use on a basis such that results can be assured under varying loadings and other conditions ordinarily upsetting to the activated sludge process.

This paper describes the process as it is applied to the milk waste discharged by the Eachus Dairies. A detailed description and discussion

The Author

of the method of control of the Oxidized Sludge Process has been published in a recent issue of this magazine.[1]

Eachus Dairies

The Eachus Dairy plant is located at the head waters of a brook on the limits of the city of West Chester, Pa. The source of this brook is a large spring on the property with a flow of about 20,000 gallons daily. This spring was to a considerable degree responsible for the selection of the site for this factory.

The plant buildings are equipped with the most modern of machinery for the handling of milk and milk products. The grounds about the buildings are beautifully landscaped and add to the pleasing surroundings for this modern food factory. (see Fig. 1.)

Bottled milk, ice cream and cottage cheese are processed. These are all sold to retail trade. Much of the ice cream and cheese is disposed of at an attractive roadside stand on the grounds. Receipts of milk vary from 8,800 to 10,600 pounds per day.

The water supply for the factory is taken from the spring and from one deep well. The liquid waste is discharged into the brook and, under dry weather conditions, constitutes the only water in the stream for some distance below. The brook flows through several fine estates, where the water is used for bathing pools and watering troughs.

The nature of this industry and the products it manufactures, the type of community in which it is located, and the lack of stream water for dilution purposes place very exacting limits on the character of the effluent which may be discharged to the stream. A modern plant of this type cannot afford to create a condition of pollution or cause an odor nuisance in a high class community in which the products of the plant are to be sold. The management realized this situation and made every attempt possible to prevent such a condition.

The history of waste treatment at this factory is similar to that of many like industries. Initial attempts were not successful, since at the time there was little information available on the treatment of this waste. Septic tanks were first constructed and, of course, failed to produce the desired effluent. About five years ago a small, inadequate trickling filter was designed and installed for the owner. The filter was 5 feet long, 7 feet wide and 18 inches deep. This filter also failed to produce the desired results, and for obvious reasons.

Two years ago a chemical precipitation tank with a capacity of about

1. "The Oxidized Sludge Process and the Equilibrium Index," E. B. Mallory, W. W. & S., Vol. 88, page 333 (August 1941).

This is the first of a series of articles by Mr. Eldridge who has figuratively lived with industrial waste treatment for the past several years.

We have been exceptionally fortunate in securing their authority to contribute up to the minute articles on the treatment of the more important and widely distributed industrial wastes.

This series of articles will be taken from material which Mr. Eldridge is working up as chapters for a text, "Industrial Waste Treatment Practice," now in the making.

Through courtesy of the McGraw-Hill Book Co., who will publish the new book, the author and "Water Works and Sewerage" have been authorized to arrange for this valuable series of articles which will constitute a goodly part of the completed book—"Industrial Waste Treatment Practice."

4,000 gallons was installed for the treatment of the wastes. It was understood at the time that the entire waste volume was to be passed through this plant. However, much of the waste by-passed the treatment tank and was discharged directly to the brook. That which passed through the chemical precipitation process was reduced too little in B.O.D. and accordingly could not meet the exacting requirements of the receiving stream.

On Sept. 8, 1939, the Lancaster Iron Works were engaged to conduct an engineering study and to design and construct an adequate treatment plant. The Mallory process at that time was still in the experimental stage at the Highland Dairy Products, Doe Run, Pa. This agreement was made subject to the approval of the results of the Doe Run tests by the Pennsylvania Department of Health. This approval was obtained a short time later.

Fig. 1—Office and Sales Room of Eachus Dairies, West Chester, Penna.

Engineering Data

The analytical results of the engineering survey, made by the Lancaster engineers, of the waste treatment problems at the Eachus Dairies are given in Table 1. These results formed the basis which was used for the design of the treatment plant.

Table 1
Engineering Data

	Aug. 2	Aug. 6
Flow—g.d.	14,900	13,000
Total solids p.p.m.	636	2,024
Volatile solids p.p.m.	422	1,696
Suspended solids p.p.m.	156	204
B.O.D. p.p.m.	238	1,013
B.O.D. lbs.-day	27.4	110.0
Population equivalent	164	660

On the basis of these studies, the proposed plant was designed for a normal load capacity of 100 pounds of B.O.D. per day and a maximum

Fig. 2—Milk Waste Treatment Plant, Eachus Dairies, West Chester, Penna.

Trim and Compact the Plant Consists Only of the Two Steel Tanks, the Wooden Building Not Being a Part of the Plant. Oxidized Sludge Unit on Left; Chemical Precipitation Unit on Right. Beneath the Tank Is the Blower Room and Laboratory.

flow rate of 20,000 gallons per day. The effluent delivered from this plant was to have a 5-day B.O.D. not to exceed 50 p.p.m. and a suspended solid concentration below 25 p.p.m.

The Treatment Plant

The treatment process, as installed by the Lancaster Iron Works, consists of two stages. The first stage involves the use of the "Mallory Oxidized Sludge Process," and the second stage involves chemical precipitation if and when required to secure the highest attainable degree of treatment. A flow diagram shows the general arrangement of the various units and appurtenances, and the routing of waste and sludge through these units. (See Fig. 3.)

The treatment plant proper consists of two all-welded plate steel tanks set on appropriate concrete bases. Wastes are pumped from a collection sump to the aeration compartment of the first stage tank. This tank is known as the aerator-clarifier. (See Figs. 2 and 3.)

The aeration compartment of the aerator-clarifier is shown in Fig. 4 as the open annular portion of the tank in which the final plate has not been installed. The cylinder in the

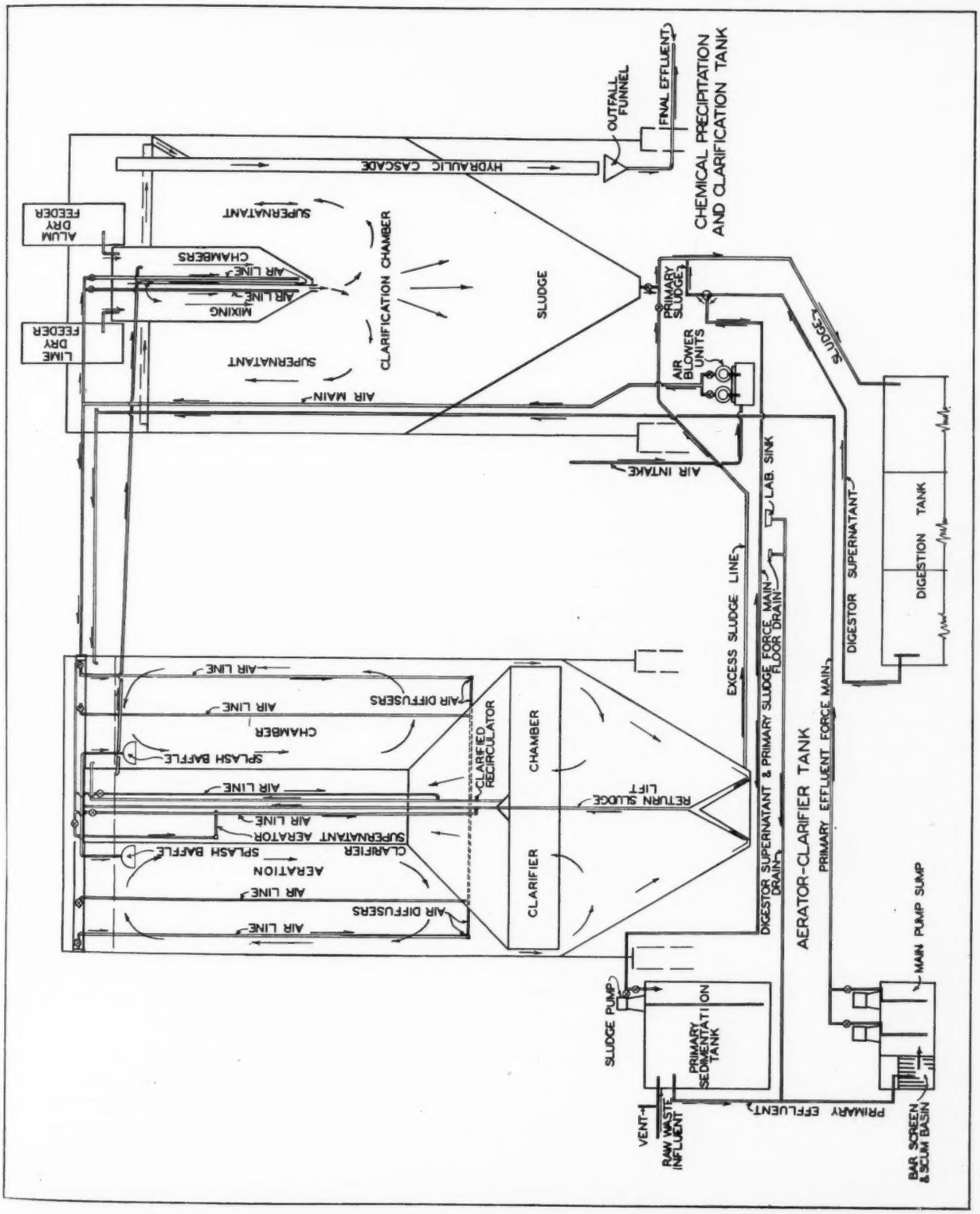


Fig. 3—Flow Diagram of Mallory "Oxidized Sludge Process" Plant, Eachus Dairies, West Chester, Penna.

center of this tank is the upper portion of the clarifier compartment. Perforated pipe air diffusers are located at the bottom of the aeration compartment and serve to thoroughly mix and aerate the mixed liquor contained in this chamber. The mixed liquor which is displaced by the incoming flow of wastes and return sludge passes downward through an annular channel surrounding the curtain wall of the clarification compartment and enters the truncated cone bottom of this compartment. (See Fig. 3.)

The floccular oxidized sludge settles in the hopper, a portion being returned to the aerator by means of an air lift, and the excess being withdrawn at intervals to the digestion tank, which will be described later. By this method the sludge blanket elevation is maintained within prescribed limits, an important factor in control of the process.

Provision has been made by which the upper liquor may also be recirculated through the aerator. This is accomplished by means of an air lift which takes the upper liquor from a point above the sludge blanket. The purpose of recirculation is to effect a further oxidation of the waste during periods of overload, and to recirculate the lighter (partially oxidized) sludge particles which may be present above the normal sludge blanket.

The clarifier supernatant passes upward into the tubular portion of the compartment, where it is again aerated to increase the oxidation and coagulation of the finely divided suspended matter. (See Fig. 3.) The effluent from this first stage of oxidized sludge treatment passes through a pipe to the second stage.

Air is supplied for the first stage process by two Roots-Connersville blowers located in the basement. One of these blowers is a "standby" to be used in case the first fails. The normal running load of each blower which supplies about 120 cubic feet of air per minute at six pounds' pressure, is 3.5 HP.

The chemical precipitation tank of the second stage consists of a flash mixing chamber and settling compartment. Waste enters a division of the mixing chamber, where alum is added, passes to a second division where lime is added, and then flows through a port in the bottom of this chamber into the clarification compartment. Alum and lime are added by means of vibrating type dry-feed machines. Agitation in the mixing chambers is accomplished by means of diffused air. Calcium hypochlorite may be added by the lime machine if it seems desirable to produce a sterile effluent and to remove essentially all of the B.O.D.

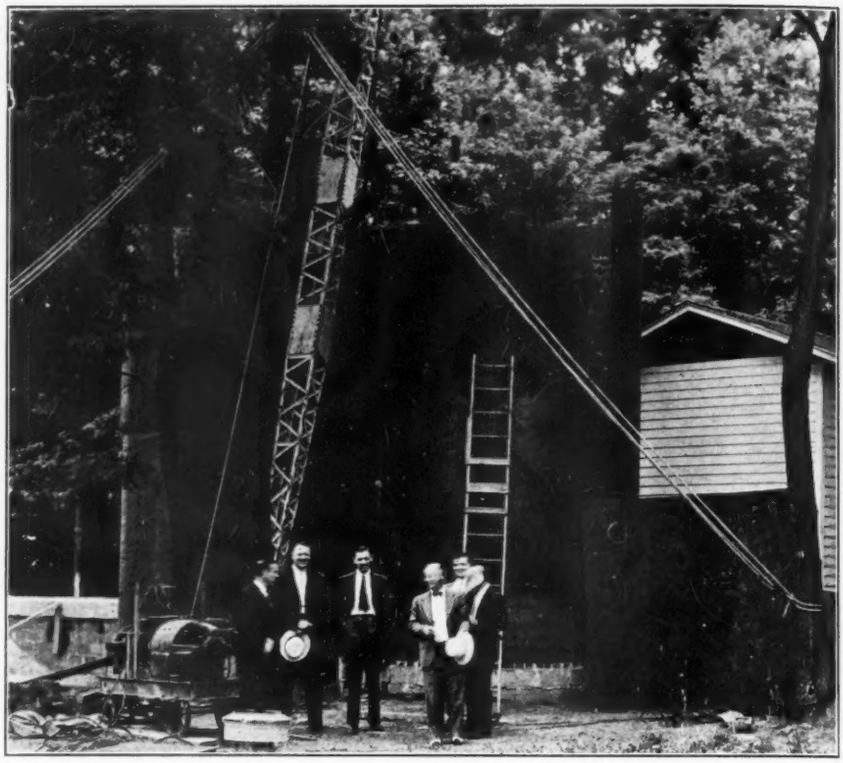


Fig. 4—Construction View, Showing Interior of Aerator-Clarifier Tank. Concrete Digester on Left

The chemical sludge collects in the hopper of the clarification compartment and is withdrawn at intervals to the digester. The clarified supernatant flows over a weir and passes downwardly through a cascade aerator to a small artificial lake. The lake was constructed by placing a dam across an area of the low land at the head waters of the brook.

The Digestion Tank

The digestion tank is a concrete structure, constructed in an excavation near the tanks. (See Figs. 3 and 4.) It has a capacity of 30,000 gallons and is divided into three compartments for stage digestion. The sludge enters the first compartment, where the major portion of the anaerobic action takes place. It then passes through openings into the second and finally to the last compartment. The supernatent liquor from this tank flows by gravity to the main collecting sump and is returned to the treatment. Digested sludge is removed at intervals by pumping it into a tank wagon and spreading it on land. The digester is not heated, which accounts for the extra large capacity provided.

A control room and laboratory is located in the basement. All sampling cocks, sludge control valves, testing and other equipment except the main pumps are located in this basement room. Fig. 2 shows the plant as it looks completed and in operation. The wooden building shown in the picture has no connection, however, with the present treatment plant.

This plant was erected and placed in operation within 30 days after the designs were approved. The first waste was delivered to the plant on August 21, 1940.

Plant Operation

The design load, as previously given, was 100 pounds of B.O.D. per day with a maximum rate of flow of 20,000 gallons per day and a short-period overload capacity of 50 per cent. The process was only guaranteed to deliver an effluent having a B.O.D. not to exceed 50 p.p.m. and a suspended solids concentration not to exceed 25 p.p.m.

A test of the plant efficiency was made on September 16, 1940, by Lancaster Iron Works engineers. The results of this test are given in Table 2. The load was almost at design capacity, 92.4 pounds of B.O.D per day. The rate of flow was 12,420 gallons per day.

A reduction of 99.3 per cent of the B.O.D. was accomplished by the first stage, or oxidized sludge process. From this standpoint, the second

stage had little to accomplish except to further reduce the suspended solids, which were already below the performance guarantees.

The alum and lime dosages were 17.3 and 5.8 pounds per day, respectively. The total sludge removed was 300 gallons per day, at which rate the digester provided a 100 day detention period.

p.p.m. B.O.D. This represents a reduction by the first stage of 97.4 per cent and by the entire process a reduction of 99.4 per cent. The design flow volume was also exceeded on this date.

On April 23 the load was 117 pounds and the reductions by the first stage and entire process were 98 and 99.6 per cent, respectively.

Table 2

Waste Treatment Plant Test Data
(Eachus Dairies, September 16, 1940)

	Raw Waste p.p.m.	Mixed Liquor p.p.m.	1st Stage Effluent* p.p.m.	Final Effluent† p.p.m.
Suspended solids	682	2,160	24	8
Suspended volatile	234	1,920	22	3
Total solids	1,920	2,328	404	474
Total volatile	800	2,066	196	123
5-day B.O.D.	892	....	6	1
Dissolved oxygen	0	3	5	10
pH	6.2	7.3	7.3	8.1
Alum dosage, p.p.m.	...	...	...	168
Lime dosage, p.p.m.	...	...	...	56
Alum dosage, lbs. day	...	...	...	17.3
Lime dosage, lbs. day	...	...	...	5.8
5-day B.O.D. lbs. day	92.4	...	0.6	...
Rate of flow, g.d.	12,420	...	...	...
Excess oxidized sludge, g.d.	...	...	100	...
Excess chemical sludge, g.d.	...	...	...	200

*Oxidized sludge stage.
†Chemical precipitation stage.

Table 3

Waste Treatment Plant Survey Data
(Pennsylvania Department of Health)

Date	April 22			April 23		
	Raw	1st Stage	Final	Raw	1st Stage	Final
	p.p.m.	p.p.m.	p.p.m.	p.p.m.	p.p.m.	p.p.m.
Suspended solids	450	35	25	380	20	20
Suspended volatile	420	30	20	380	20	15
Total solids	940	370	505	1,180	364	465
Total volatile	700	140	110	900	120	110
5-day B.O.D.	969	25	6	890	18	5
pH	5.2	8.0	8.1	4.4	8.0	8.4
	g. d.			g. d.		
Waste volume	22.690			15.720		
	lbs. day	lbs. day	lbs. day	lbs. day	lbs. day	lbs. day
5-day B.O.D.	180	4.7	1.1	117	2.4	0.7
Alum	...	...	24.6	...	...	24.6
Lime	...	...	7.4	...	...	7.4

Table 4

Typical Weekly Record of Plant Control Data

Date, 1941	Waste Flow	Mixed Liquor Solids %	Mixed Liquor Settling c.c. Liter 15 min.	30 min.	pH 1st Stage	pH Final Stage	D. O. 1st Stage p.p.m.	D. O. Final Stage p.p.m.	Relative Stability %	Sludge — Oxid. g.d.	Sludge — Chem. g.d.
June 15..	16,500	3.6	425	305	7.4	7.2	10	12	99	700	600
16..	18,100	4.3	830	670	..	7.2	9	11	99	750	330
17..	12,570	4.8	720	750	..	8.2	9	12	99	1,200	210
18..	22,200	3.4	500	320	..	8.2	8	12	99	750	510
19..	22,400	2.9	340	290	7.4	7.6	12	12	99	200	240
20..	16,020	3.2	490	350	..	7.6	9	12	99	...	180
21..	15,900	4.5	840	700	..	7.8	10	12	99	400	240

The Pennsylvania Department of Health made a survey of this plant on April 22 and 23, 1941. Table 3 shows the results of this survey. The B.O.D. load applied on these two days was greater than the design load. On April 22 the plant successfully handled an 80 per cent overload (180 pounds of B.O.D.) and produced an effluent having but 6 The flow volume on this date was within the design rating.

The suspended solids concentration of the effluents on these two dates was below that provided for in the design. The pH values are of interest, since the raw waste exhibited a low pH and a decided acid reaction. The effluent from the first stage, however, showed a pH of 8.0.

Process Control

Since this is a small installation, it is impossible to provide or to justify technical supervision. Complicated tests which require more or less costly apparatus, such as the total and suspended solids and the B.O.D. tests, cannot be made.

The operation of the treatment process is controlled by the use of a few simple tests consisting of pH, settling rates, solids concentration, relative stability and dissolved oxygen. The pH tests are made by means of Hellige disks. Settling rates are determined by the use of the standard 2-liter settleometer. A clinical centrifuge and 15-ml. A. P. I. tubes are used for the solids concentration tests. Values are expressed in the per cent of the tube volume occupied by the sludge after the "spin." Dissolved oxygen tests are made by the amidol method, for which standards are prepared in the Lancaster engineering laboratory.

The operator controls the plant by keeping plant conditions at predetermined values which are established by the Lancaster laboratories. For instance, he keeps the solids concentration of the mixed liquor at 4 per cent, which is the value for which this particular plant was designed. If the concentration is greater than this value, he refers to a chart which indicates the length of time he is to draw excess sludge. By following a few simple instructions such as these, the operator can keep the plant under perfect control.

Alum is adjusted by sight. Sufficient chemical is added to produce a well defined floc. Lime is added to adjust the pH to 7.5 after the addition of the alum. [The pH adjustment is a requirement of the State Department of Health.] Chemical sludge is drawn once each day until a clear liquor is obtained. Excess sludge is drawn to the extent required to maintain the mixed liquor solids concentration within the prescribed range. In other words, the wasting of sludge is the control which determines the solids concentration in the aerating stage.

Daily records are kept which show the data pertinent to plant control and as a record of plant efficiencies. Copies of these records are sent to the State Department of Health and to the Lancaster Research Laboratories. Table 4 shows extracts from a typical weekly record. The minor extent of laboratory work involved is apparent.

The volume of waste exceeds the design volume on several days each week. Mixed liquor solids concentra-

tion varies on both sides of the required value, but this variation is well within the latitude of the process. The relative stability of the effluent is always above 99. The dissolved oxygen of the effluent is also very high. Daily sludge volumes vary according to the load delivered to the plant.

Cost Considerations

Because of the precise control of the process, the aerator size is about 25 per cent of that required in standard activated sludge practice. This reduced requirement is reflected in the cost of the plant and in the cost of operation. Steel construction also contributes to lowering the cost, since steel tanks of this size may be built for about 50 per cent of the cost of concrete tanks of the same capacity. The cost of construction of this plant is not given here since it would definitely be misleading. Many items were necessary in this installation which would not be required in others as, for instance, the construction of the lake.

Fig. 5—Collection Sump With Complete Treatment Plant Beyond

Table 5 shows an analysis of operating costs. On the design basis the daily cost per pound of B.O.D. removed was 2.6 cents. This reduced to a per capita population equivalent cost is about 0.43 cent per day or $1.57 per year. The annual cost of operation of this plant, including interest and depreciation, is $930.

Table 5

Analysis of Operating Costs

	Per Day
Labor	$ .50
Power, 82.8 K.W.H.	1.24
Lime, 7.4 lbs.	.04
Alum, 24.6 lbs.	.42
Total operation	$2.20*
Interest and depreciation	.35
Total cost	$2.55

Cost per pound of B.O.D. at 100 lbs. loading, 2.6 cents.

Cost per pound of B.O.D. at 180 lbs. loading, 1.4 cents.

*Without the chemical precipitation stage, $1.74.

EXCAVATION CHART*

We often want to know the number of cubic yards in long, narrow, shallow excavations. The depth is usually given in inches and the width and length in feet.

The chart herewith has been developed purposely to take care of excavations of that kind. The depth, Column A, is given in inches, while the width, Column B, and length, Column D, are given in feet.

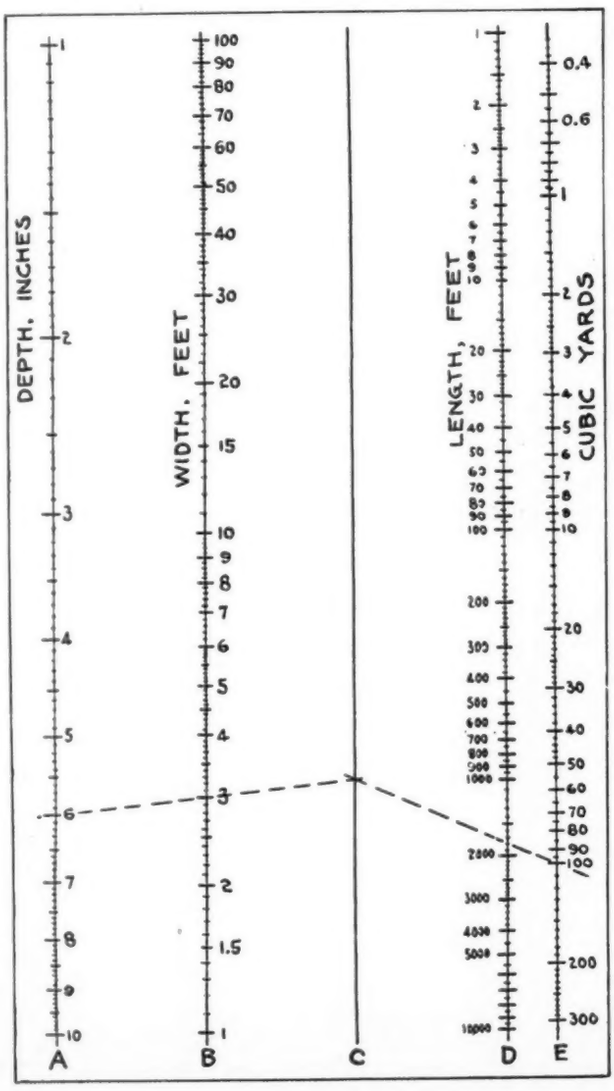
Simply run two zigzag lines across the chart as indicated by the dotted lines and the number of cubic yards is instantly given in Column E.

For example, the dotted lines drawn across the chart show that if we have an excavation 6 in. deep (col. A) by 3 ft. wide (col. B), and 1,800 ft. long (col. D), the number of cubic yards will be found to be exactly 100 in Column E.

But that isn't all. The chart will also take care of deep excavations. Thus, if the depth is 60 inches instead of 6, the same dotted line will give the answer as 1,000 cubic yards instead of 100. That is, if a digit is added in column A, a digit must also be added in column E. Likewise, if a digit is added in column B, a digit must be added in column E.

It is, therefore, evident, that this chart will easily take care of almost any rectangular excavation and it will give results that are surprisingly accurate.

*Contributed by W. F. Schaphorst, M. E., Newark, N. J.



ELIMINATION OF GAS HAZARDS AT SEWAGE TREATMENT PLANTS

And Elements of Design in Gas Handling and Utilization Systems

PART 2—PIPING, STORAGE AND SYSTEM OPERATION

By The Engineering Department
PACIFIC FLUSH-TANK COMPANY
CHICAGO, ILLINOIS

This is the second and concluding installment of a valuable article on the subject of gas hazards at sewage treatment plants, and their elimination.

This authoritative contribution has developed as the result of repeated efforts to obtain such a composite production from a group of engineers with extended and varied first hand experience over a period of years in studying and improving gas handling systems and their operation, and in advancing the design and application of equipment for the purpose of eliminating hazards and operating risks in the handling and utilization of gas.

Part 1 of this article which deals with general design considerations and the correct application of protective devices, appeared in the September number of Water Works and Sewerage.

Design of the Gas System

GAS pressures available to operate sewage gas systems are quite limited. Quite often the maximum pressures available at the digester will be limited to 5 in. or 6 in. of water column. With 2 in. or 3 in. required to operate a gas fired boiler it is imperative that losses in flame traps, gas meters and other control devices, as well as the gas piping, be kept to a minimum.

(a) *Layout*

The piping should be carefully arranged to eliminate all unnecessary bends and fittings and should be as simple and as compact as possible. The layout should allow all elements of the system to be accessible for inspection and servicing. All pipes should have ample slope to drain all moisture condensed from the gas to low points, where manually operated drip traps should be provided to allow the removal of this condensate. Provision should be made for observing and keeping a check on gas pressures at critical points in the system. Thereby, the operator may easily determine the location and correct the cause of excessive pressure losses in the system.

(b) *Pressure losses—Size of piping*

Actual pressure losses, checked at plants which have been in service for some time, indicate considerable variance from pressure loss values computed by applying theoretical formulae. Losses have often been observed in excess of double the computed theoretical losses. It is quite probable that the sewage gas supersaturated with moisture and carrying particles of sludge and carbon in suspension, will form deposits in the gas lines. It has been noted from the operation records of various plants that during the starting up period the gas production may be 2 or 3 times the average expected production. The system must be designed to handle this condition which may last for quite an extended period of time. By providing for these peaks of gas production, while also taking into account the discrepancies between theoretical and observed values in losses, ample sized gas piping may be provided.

Where digester pressures of 5 in. to 6 in. are available, it is desirable to limit the losses between the digester and the point of use to about 1½ inches at the maximum gas flow. This will allow about ½ inch pressure differential for operation of the pressure relief to allow excess gas to pass to the waste-burner. The 1½ inch loss must include losses in gas lines, meters, flame traps, etc. It is desirable to provide the gas meters large enough to pass the maximum flow of gas with a pressure loss not to exceed ½ inch. The loss through the flame trap might also be limited to ½ inch. In most simple systems, the loss in the gas piping will be the only additional factor to be considered. This piping should be of ample size so that the loss in the piping system will not exceed ½ inch.

In gas systems where special equipment is required, such as gas scrubbers for hydrogen sulphide removal, excessive losses may require pressures in excess of that available at the digester. Fan type boosters can be placed in the system which will economically provide for any increase in pressure required. If this type booster is used it should be preceded by a pressure regulator to prevent the booster drawing a vacuum in the supply line, and bringing in air from the vacuum relief at the gas collector, when the rate of gas production is less than the capacity of the booster. The booster should also be provided with a mercoid shut-off switch to stop the booster when the pressure in the supply line drops to about 1 inch water column.

Storage of Gas

With the rapid increase in the number of uses for sludge gas, emphasis is now being placed on a more complete utilization of all gas produced. It may sometimes be found economically feasible to provide gas storage to secure a more complete use of this gas, but it must not be overlooked that the collection and storage of a large volume of inflammable and potentially explosive gas will add to the hazards in the gas utilization system. With a large volume of gas constantly available it is imperative that all protective and automatic shut-off devices and other controls are at all times functioning properly, also the possibility of securing an explosive mixture in a gas holder makes the selection of the proper type storage unit and controls very important.

(a) *Types of Gas Storage Holders*

There are two main types of gas storage holders now in successful use in connection with the storage of gas at sewage treatment plants—the gravity storage holder and the pressure storage holder. The gravity type unit usually consists of a full volume lift in liquid seal tank. (See Fig. 10.) There are, however, several successful installations of the piston type of gravity holder, this unit consisting of a movable piston

in a steel holder tank provided with a mechanical sealing joint between the piston and the tank shell. This type of unit is generally used for storing very large volumes of gas.

The gravity type holder, whether of the piston or full volume lift, has the advantage of producing a uniform pressure over the entire range of effective capacity, but this pressure is dependent upon the weight of the moving element and in most cases is limited to a maximum of from 5 inches to 9 inches of water column. Pressure type holders operating at pressures up to about 50 pounds per square inch, provide the effective capacity by compressing the gas to ⅓ or ¼ its normal volume, and consequently for the same effective storage will take considerably less space. The pressure type unit will generally be more economical except in the smaller sizes, where the cost of the auxiliaries, which include compressors, automatic controls, pressure reducing and regulating valves, etc., offset the saving due to reduced size of the holder. Pressure storage will increase somewhat the complexity of controls, but they do provide practically an unlimited pressure which may be desirable in some cases, particularly in connection with utilizing of the gas in an incinerator where it may be desirable to operate mixing burners at pressures of from 2 to 10 pounds per square inch. Pressure holders are available either in cylindrical or spherical shaped units. (See Fig. 11.) The cylindrical or "bullet" holders are generally most economical for capacities up to about 15,000 cubic feet and for larger units the spherical holders will be found more economical.

(b) *Storage Requirements*

Regardless of the type of storage, controls may be provided so that only the gas which is produced in excess of the rate at which it is being consumed need be stored. By operating in this manner, the cost of compressing the gas for pressure storage will not be a major consideration. Automatic controls will allow excess gas to go to storage during periods when the production exceeds the consumption and to automatically bleed gas into the system when the consumption exceeds the production. By effectively scheduling the additions of solids to the digesters and maintenance of the proper digester temperature a fairly uniform rate of gas production may be maintained so that where a normal steady use is contemplated, little or no gas storage may be necessary. For example, if gas is to be used solely for heating purposes by consumption in a gas fired boiler, the boiler will provide sufficient flexibility to burn all of the gas at the variations in rate of production which may be expected.

Where gas engines are provided, or where other uses are contemplated, the relationship of gas consumption to the expected production constitutes the critical factor in determining the quantity of gas storage necessary. If gas engine capacity is provided to consume the entire day's expected production in 8 hours, to eliminate peak power demand charges, it will be necessary to provide more storage than for an engine approximately one-third of the size which will be designed to operate continuously. The Tallman's Island plant of New York City with essentially no gas storage operates some 3580 connected horse power of gas engines to drive blowers and pumps, providing all but a small fraction of the total power required to operate the complete activated sludge plant, including pumping of all sewage.* A study of the requirements for utilizing the sewage gas at the Westerly Plant at Cleveland, Ohio, for operation of an incinerator, indicated that 90 per cent of the annual gas production could be utilized by providing gas storage capacity equivalent to about 8 hours average production. On the other hand, for 100 per cent utilization a gas storage capacity equivalent to about 48 hours average production would be necessary. It was deemed economically feasible to provide only storage equivalent to 8 hours normal

*It must be said, however, that the Tallman's Island plant is not without the equivalent of a storage tank. This, inasmuch as the plant system is inter-connected with the system of the local gas company, which automatically comes into use if and when required.

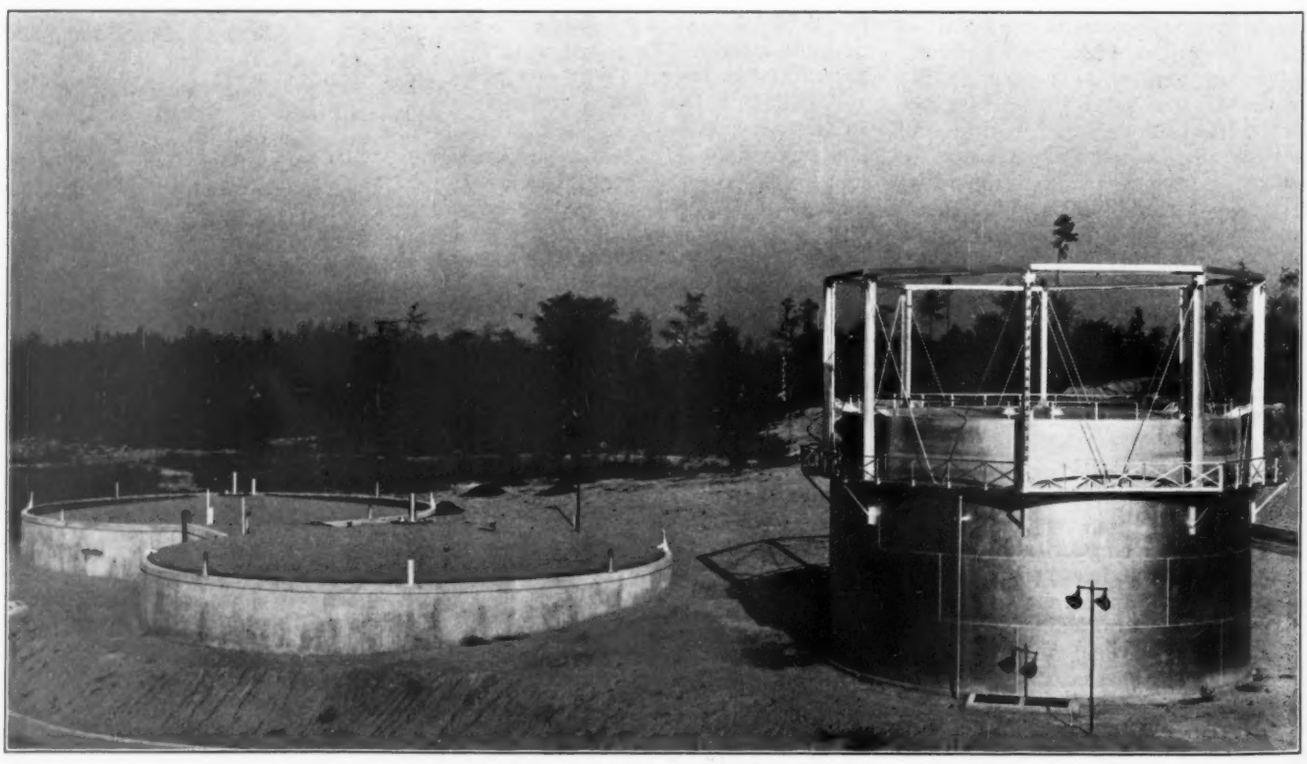


Fig. 10—Gravity Lift Type Gas Holder—Greensboro, N. C.

production, which would allow for the utilization of 90 per cent of the annual production. From these examples it may be seen that each plant design presents a separate problem and the amount of storage will be an economic study to be considered in the light of the individual conditions.

The most hazardous condition resulting from the use of gas holders develops when the holder is first put into service. As previously indicated, sewage gas presents an explosion hazard only when mixed with air. All gas holders should be completely purged before placing in operation by replacing the air with an inert gas such as carbon dioxide or nitrogen before adding sewage gas. This will eliminate the hazards of the explosive air and gas mixture.

Operation

It is impossible to design any system for the utilization of sludge gas which will be *completely* foolproof. Consequently, it is important that the operator realize the hazards which may be present and exercise ample care in operation. The operator must have a full knowledge of each device in the system and its function and relationship to the operation of all other units. A large scale diagram of the entire gas utilization system showing each device such as flame trap, drip trap, boiler controls, etc., together with pertinent notes indicating the function and the required attention for each device, will help the operator to become acquainted with the problems involved in his particular plant. A diagram of this type, similar to that shown in Fig. 12, if posted in a conspicuous and convenient place, will be a constant reminder to the operator of the importance of the proper function of each unit for safe operation. Operating and maintenance instructions for each device may well be posted adjacent to each individual piece of equipment.

One of the most troublesome problems in the operation of a gas system is the removal of moisture condensate which collects in the gas lines. Drip traps are provided to allow the removal of this water at all low points in the system, but excessive moisture will sometimes collect in gas meters and other units. Provision should be made at critical points on the system for checking the gas pressures. By periodically checking the gas pressures at these critical points, the operator can readily determine the losses through the various units and note at a glance whether there is any restriction to the flow of gas. An excessive pressure loss through the gas meter or flame trap will indicate trouble at this point and the unit should be completely checked. The collection of moisture or possible clogging with some of the impurities from the gas will generally be the cause of excessive losses. All protective devices should be periodically checked to assure their proper operation. Flame trap elements should be inspected to be certain that they are not becoming clogged or corroded. The valve shut-offs on flame traps, the high temperature thermal shut-off and the thermo-pilot shut-off on the boiler, the low-pressure cut-offs and pressure reliefs, should be periodically operated to make sure that they are in operable condition.

With a properly designed system the operator's work may be simplified, but no matter how careful the designer may be, there is always a hazard present in any sewage gas utilization system and only by intelligent operation and proper care and maintenance can any gas utilization system be safely operated.

Summary

To summarize, the subject of the design of gas utilization systems and the elimination of gas hazards, the following points should be borne in mind by the designing engineer and the plant operator:

(1) Gas systems should be kept under positive pressure at all times to eliminate air and gas mixtures entering the digestion tank, gas storage holder or gas piping system.

(2) Sources of ignition should be eliminated insofar as possible:

(a) Explosion proof motors and switches should be used in all

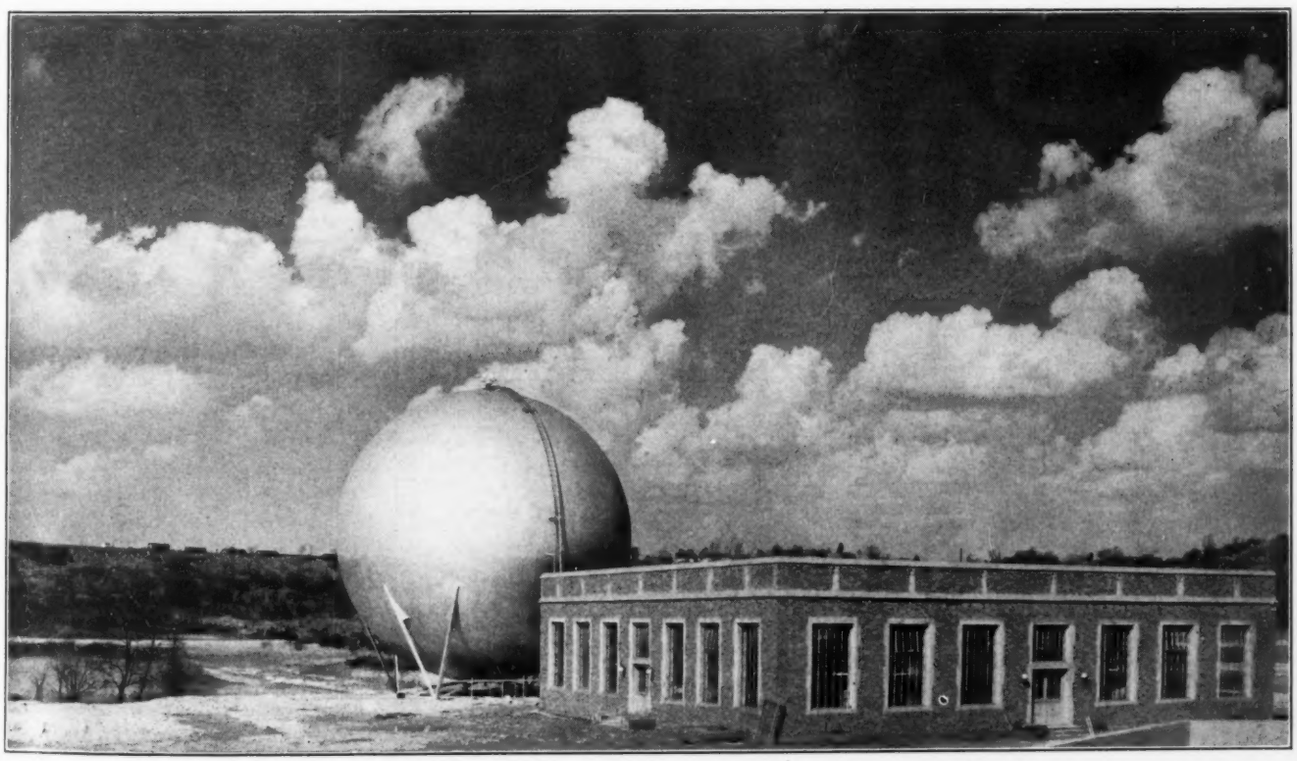


Fig. 11—Spherical Pressure Type Gas Holder—Southerly Plant, Cleveland, Ohio.

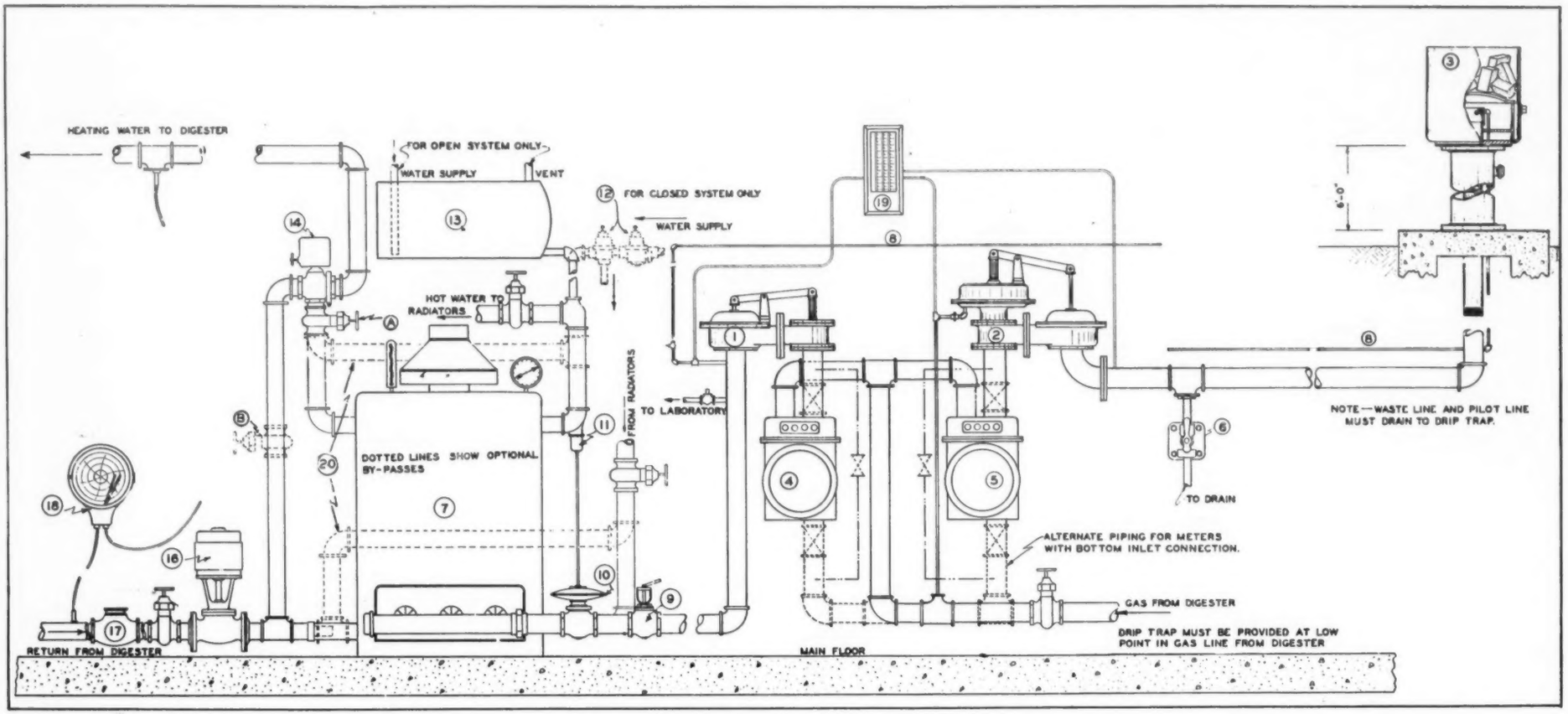

HEATING WATER TO DIGESTER
FOR OPEN SYSTEM ONLY
WATER SUPPLY
VENT
FOR CLOSED SYSTEM ONLY
WATER SUPPLY
HOT WATER TO RADIATORS
FROM RADIATORS
TO LABORATORY
DOTTED LINES SHOW OPTIONAL BY-PASSES
TO DRAIN
NOTE—WASTE LINE AND PILOT LINE MUST DRAIN TO DRIP TRAP.
ALTERNATE PIPING FOR METERS WITH BOTTOM INLET CONNECTION.
GAS FROM DIGESTER
DRIP TRAP MUST BE PROVIDED AT LOW POINT IN GAS LINE FROM DIGESTER
RETURN FROM DIGESTER
MAIN FLOOR
6'-0"

Fig. 12.—Diagrammatic Layout of Gas System.

Instructions for Operation, Inspection and Maintenance

(1) Flame Trap—Check every six months (Oct. 1st-May 1st) operation of shut-off valve, and check every six months (Oct. 1st-May 1st) flame trap element, clean or replace if necessary.

(2) Pressure Relief and Waste Gas Flame Trap—Inspect every six months (Oct. 1st-May 1st) diaphragm of pressure relief.

(4 & 5) Gas Meters—Record reading 8:00 A. M. daily.

(6) Drip Traps—Remove moisture 8:00 A. M. and 6 P. M. daily.

(7) Boilers—Check thermo-pilot and shut-off valve operation weekly (Monday).

(11) Boiler Shut-Off—Check thermostatically controlled boiler shut-off weekly (Monday).

(19) Pressures—Check pressures in system daily at 8:00 A. M.

buildings and control chambers where gas-air mixtures may be present.

(b) Open flames of no type should be allowed in the vicinity of tanks producing or storing gas. Warning signs such as "Danger — Explosive Gas," "No Smoking," should be conspicuously posted.

(c) Tools used in the vicinity of digestion tanks or gas storage tanks should be of a non-sparking nature.

(3) Unattended visitors should not be allowed around sewage treatment plants, especially in the vicinity of units producing or storing gas.

(4) Tanks recently emptied or being emptied should not be entered unless completely purged of gas and properly ventilated while an operator is working in the tank.

(5) Water seal traps or other water seal devices should not be allowed in a gas system.

(6) Flame traps of tried and proven design should be used rather than "home-made" devices.

(7) Flame traps should be placed adjacent to points of burning of gas, it being desirable to use an individual flame trap at each major point of gas use.

(8) All control chambers containing gas lines or appurtenances should be ventilated by means of a forced draft fan.

(9) All control chambers should be provided with ground level entrances.

(a) Portions of chambers not accessible by ground level entrance should be provided with convenient type stairway and designed so as not to require entrance of the operator during normal operation.

(b) Valve stems for valves located in inaccessible chambers should be extended to section of chamber which is easily accessible.

(c) Where operators find it necessary to enter inaccessible chambers for purpose of making repairs, etc., or find it necessary to enter dewatered digestion tanks, this should not be done unless another operator is on the outside and has access to a gas mask and other rescue means.

(d) Gas fired boilers should not be located in inaccessible chambers and proper stack ventilation should be provided.

(10) Safety equipment, consisting of gas mask and fire extinguisher, should be provided adjacent to points of danger.

(a) It is also desirable to provide suitable instruments for detecting explosive and toxic gases in control chambers.

(b) A telephone should be provided at each treatment plant for use in summoning aid in case of fire, explosion, etc.

(11) Gas appurtenances should be housed in a room separated from other portions of a control chamber or building. This room should be ventilated with its own ventilation system and have a separate entrance from the outside.

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Sewer Odor Traps

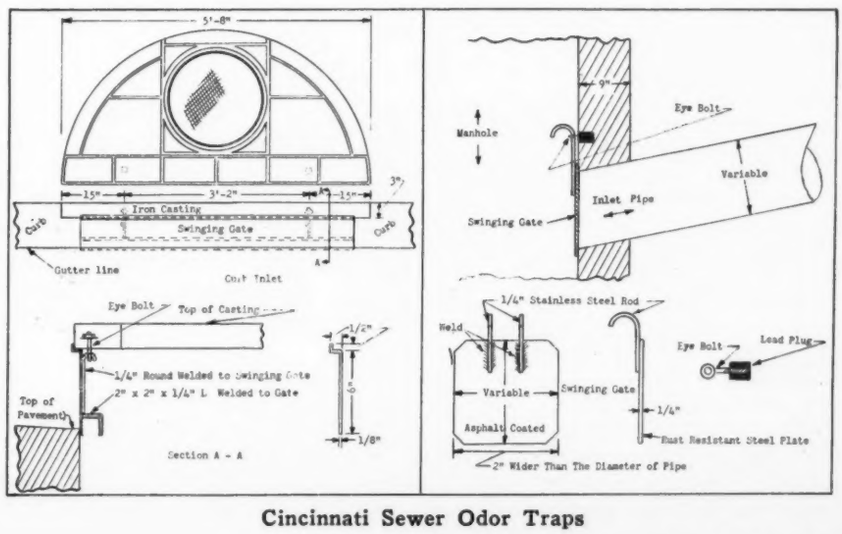
For Manholes and Inlets

To hold in sewer gases and prevent the emanation of objectionable sewer odors from storm inlets to combined sewers and sewer manholes the here sketched swinging flap-gate arrangement has been designed and installed in Cincinnati by the Department of Public Works.

The trap for inlets (left) consists of a swing gate of ⅛ in. metal, fabricated and installed as sketched. The gate flap, reinforced and weighted with an angle iron welded across the bottom, opens inward under force of storm water and returns to closed position thereafter.

The trap for manholes consists of swing gates on all inlet sewers entering the manhole (right) and are apparently intended to preclude odors and gas from working back up-sewer rather than to prevent odors emanating at the top of the manholes so equipped. Naturally, the latter source of sewer odors can be corrected by plugging what appear to be of more hazard and detriment than of help—the vent holes in manhole lids—and employing rattle preventing "Tapax," or its equivalent, for sealing the space between the lid and the manhole frame.

It will be noted that non-corrodible metal and bituminous coating are used to preclude corrosion of the flap gates and hinges employed in manholes.



Cincinnati Sewer Odor Traps

PENNSYLVANIA OPERATORS MEET

Once Again Vote Down Licensing; Try Fall Meeting With Success

THE 14th Annual Conference of the Pennsylvania Water Works Operators Association was held on Pa. State College Campus September 1st to 3rd inclusive. In the past these meetings have been held in the Spring but the Fall dates appeared to be as acceptable to the members, and the registration of 250

Presidents

"Larry" Morgan, Engineer State Dept. Health Greensburg, Pa. (Retiring)

Harry Krum Chemist Water & Sew. Dept. Allentown, Pa. (Incoming)

compares favorably with previous meetings in the Spring or Summer. The reason for the change was to avoid a conflict with the A.W.W.A. Convention in June.

Licensing Defeated

Pennsylvania operators have now been battling over operator licensing since 1934 when the first attempt to secure licensing of purification plant operators only met defeat at the hands of the private water companies who felt that the entire matter was being somewhat railroaded and brought needless additional regulations on the private company where licencing was needed least. This year a packed session listened intently to the report of the Committee on Licensing, voted the Chairman thanks and voted it down by a good majority. Before the vote was taken two members of the committee stated that they (individually) were of the opinion that water works operator licensing was not practical for Pennsylvania, because of the large number of privately owned plants and because of the mishandling of earlier licensing regulations (engineering but not water) by a similar method to that recommended by the Committee. Upon voting, the majority against licensing for the time being was overwhelming. Then Professor E. D. Walker, who has worked since 1934 to get for Pennsylvania a licensing act was given a rising vote of appreciation.

High Spots of the Technical Program

The technical program took the aspect of a National Convention with such stellar performers as Marsden Smith of Richmond Paul Weir of Atlanta; Harry Jordan, of A.W.W.A.; Carl J. Lauter, of Washington; Carl P. Brown, also of Washington; F. W. Jones of Cleveland; George Norcom of New York.

The "Information Please" hour, was of high interest and many complained of cutting it too short. The experts sitting on the panel were Smith, Weir, Norcom and Lauter. The referees were W. W. Bush, John H. Murdoch Jr. and L. H. Enslow, whose duty it was to decide whether the questioner was to be paid a dollar for having stumped the specialists or whether the answers were adequate. This year only one question was not effectively answered. Possibly the reader who has never been on hand for one of these "wide open" Information Please programs will not realize how much free information and fun therewith can be had from one of these panel sessions. The idea may sound to be over-worked but it is apparently still good and draws a goodly attendance.

President's Cup to Armstrong

The highly prized President's Cup was this year awarded to Paul S. Armstrong, City Chemist, Easton, Pa., for his investigative work on the mechanism of cathodic protection applied to steel tanks and standpipes. The presentation was made by L. H. Enslow to W. B. Johnson, Supt. at Easton, with an especial admonition that Mr. Armstrong must not unintentionally let the local press of Easton assume that the President's Cup was won in the golf

Glace and Guests

"Mike" Glace, long-time secretary of the Association, with "imported programmers" who added much. On Mike's right is Paul Weir, Supt. of Filtration at Atlanta, Ga.; on his left, Marsden Smith, Director and Chief Engr. of Water, Gas and Electricity, Richmond, Va. Neither needs any further introduction to readers of this magazine.

tournament, as did a certain Allentown member the year that he held the cup and had a picture of himself holding the cup with Secy. Glace in the background.

Officers for 1941-42

President

Harry J. Krum, Supt. of Filtration, Allentown, Pa.

1st Vice-President

Jas. G. Griffiths, Supt. Kensington, Water Co., New Kensington, Pa.

2nd Vice-President

N. B. Lyle, Vice-President, Scranton Sp'r. Brook Water Co., Scranton, Pa.

I. M. Glace continues as Secy.-Treas. and L. S. Morgan, retiring president, continues as a member of the Executive Committee by reason of being Immediate Past-President.

Vice-Presidents

Jim Griffiths, Mgr. Kensington Water Co. N. Kensington, Pa

Newton Lyle Vice-Pres. Scranton-Spring Brook Water Co. Scranton, Pa.

(The newly elected V. P., on the right, is wearing the insignia designating his elevation to officialdom, also that "he's a jolly good fellow.")

Entertainment

In charge of the "Unholy 3"—"Casey" Jones, Charlie Thomas and Bob Mowry—as the committee, the entertainment consisted of a joint golf tournament with the Pa. Sewage Works Assn. and a Buffet Supper following the "Information Please" program on the second evening. Door and Advertising Prizes in connection with the Journal were awarded the same evening.

The first prize of $30.00 for the nearest correct answer to questions which could be answered by reviewing ads in the Journal for the year was won by Pierce Bechtel, Supt., North Penn Water District, Reading, Pa. Second prize of $20.00 was won by O. A. Newquist, Supt., Spring Water Co., Kane, Pa., and third prize of $10.00 went to Col. Frank Daniels, State Dept. of Health

Sr. Chemist, who seems to have the prize winning habit, even being able to draw his own number out of the hat practically every year, without even trying. "Honest" Frank is always called upon to do the drawing because of his long reputation for being that way, and because he turns so wonderfully "pink" when it happens. We wouldn't, however, put it past the committee (abbetted by Glace) to trick the Colonel, because it makes such a swell show when it all happens.

J. H. Murdoch, Jr.
Attorney
Am. Water Wks. & Elec. Co.
New York
(As usual, gave a splendid paper)

Pierce Bechtel
Manager
Mt. Penn Water Authority
Mt. Penn, Pa.
(Won the Journal contest and prize)

Papers and Discussion

The first evening session was given over to lectures on "Phenomena and Principles of Hydraulic" followed by demonstrations in the recently revamped and improved Hydraulic Lab. at Penna. State College. On hand was Prof. F. T. Mavis, recently appointed head of the Dept. of Civil Engineering. The lectures were given by Professor G. A. Rohlich, in Sanitary Engineering and G. R. Villemonte, Instructor in Hydraulics.

"A Study of the Effects of Cathodic Treatment on Water Quality" —by Paul S. Armstrong, City Chemist, Easton, Pa.

This was the opening paper and that awarded highest rating as a research type of paper. The paper was read by Secy. Glace because the author was prevented from attending. It is one of those papers which does not readily condense without losing some pertinent points and factors. Although the experiments have been under way for 15 months the author states that it seems to be just the beginning, with the two principal companies in the field assisting and supplying equipment. The findings of principal interest seemed to be that in a non-pulsating tank alkalinity of the water 30 p.p.m is gradually reduced to zero if the voltage is high and current low (11.5 v.; 0.24 amps.). Simultaneously iron increase and color boost is noted, the iron fluctuating 1 to 4 p.p.m and color to 200 parts. The iron was traced to the steel anode and the trouble stopped when the voltage was reduced to 5 and under.

A study on a new 12 in. diameter tank made of stove pipe iron sheeting revealed some pertinent information. The surface had already a rust film which from submerged areas completely disappeared after starting the cathodic run. The area between the high and low water lines and receiving daily exposure. Although the hydrogen film was being produced as evidenced by the reduction of the rust no bubbles could be detected until the rust (oxide) had been completely reduced to what appeared to be a dark gray powder of metallic iron.

Mr. Armstrong's conclusions were that nothing had developed in the experiments to change the opinion that the method is satisfactory for Easton conditions. However, they had learned what should not be done in respect to forcing too much current through a tuberculated tank with minor water replacement in the upper levels. The studies to be continued were expected to reveal the limitations of the method on waters as low in calcium alkalinity (22 to 30 p.p.m.) as the Easton supply and the possible value of hardness increase to aid the process.

Paul Weir, Supt. of Filtration, Atlanta, Ga., was the scheduled discussor. In comparing the Easton results with those obtained at Atlanta on laboratory model tests, it seems a mistake to start with a badly tuberculated surface. Further, in obtaining the ultimate effects patience was needed and nothing higher than 10 volts on the primary and 0.04 amps. on the secondary could be justified.

Like most chemically trained operators Mr. Weir was impressed with the scientific soundness of the method which seemed assured of a permanent place in water works practice. While true that the process offered protection of already tuberculated tanks the disappearance of the ossified rust was slow. Since one should not demand as much of a protective process it would seem sounder practice to at least remove the tuberculation and loose paint while installing the equipment, and preferably the tank should be painted and dependence then placed on the cathodic process to hold the renewed condition.

Harry E. Jordan
Exec. Secy., A.W.W.A.
New York
(Came to talk on operator licensing and priorities—did a swell job at both.)

Frank Milne
Hersey Meter Co.
Warren, Pa.
(One of two mgrs.' representatives having the distinction of being charter members.)

The question was raised on the floor concerning the possible removal of existing paint from the tank wall and how to prevent it.

E. H. Ingle, Mgr. Electro-Rustproofing Co., Dayton, Ohio, replied

R. H. Snyder, Mgr.
Consumers Water Co.
Montrose, Pa.

•

V. F. Rigling, Engr.
N. E. Water Service Co.
Lemoyne, Pa.

•

V. B. Corle, Mgr.
Gettysburg Water Co.
Gettysburg, Pa.

R. G. Sphar
Asst. Supt.

•

Sam G. Byrne
Chief Engr.

•

J. R. Carson
Asst. Supt.

—

All with Tri-Cities Water Co.
Charleroi, Pa.

W & T's "Bob" Mowry (Philadelphia)

•

"Cy" Tygert (Newark)
Judging from the smiles chlorinators are going fast.

C. R. Keatley
Engineer Board
Fort Belvoir, Va.

•

Dean McCrory
Pa. Salt Co.
Pittsburgh

•

Arthur Martin
Manager
Oil City Water Dept.

Mathieson Alk.'s Bill Eastburn (Philadelphia)

•

Fred Durner (Pittsburgh)

•

Ralph Carr (New York)

that coatings on new tanks were not necessary, especially if phosphoric-acid pickeled. In old tanks an excess of current will remove paint but if the installation is properly engineered at installation there should be no high excess of current to waste money and cause the difficulties enumerated by Mr. Armstrong, such as iron peptization and acidification of the water.

P. S. Wilson, Consulting Eng., Glen Ridge, N. J., pointed out that iron rust is never a problem in plant scale installations, and the Easton studies showed what high current density would do. To find any difference in the graphite or carbon electrode and the stainless steel electrode in current used would be difficult. The socalled calcium plating phenomena in the process was more likely a precipitation of calcium carbonate at the tank surface where high alkalinity prevails—i.e., nothing more than a water softening effect.

Harry E. Moses, Chief Engineer
Pa. State Dept. of Health

Harry M. Freeburn, Chief Engineer
Phila. Suburban Water Co., Bryn Mawr, Pa.
(Past-president and cup donor)

W. W. Darby, Gen'l Mgr.
Tri-Cities Water Co., Charleroi, Pa.
(For 33 years with his company)

"The Effect of Silting in Storage Reservoirs and Preventative Measures"—by Carl P. Brown, Head, Reservoir Section, Soil Conservation Service, Washington, D. C.

Mr. Brown presented in somewhat condensed form the same paper presented before the A.W.W.A. Convention and printed in full in the June, 1941, issue of WATER WORKS & SEWERAGE. Without question the most practical and suggestive paper ever written on the reservoir silting problem, any reader who has not done so should review Mr. Brown's outstanding contribution.

The second most critical factors in reservoir silting is the rates of erosion. The first most important factor is the ratio of whole drainage area to the volume of the reservoir. The one cheapest and most practical scheme of solving silting problems is to build the reservoir amply large on a drainage area no larger than is ample. A matter to remember is that it is usually cheaper to abandon and relocate a new reservoir than to attempt desilting the old.

In regards the ratio of watershed to reservoir size anything less than 50 acre ft. of reservoir capacity per sq. mile of drainage area usually spelled troubles unless the watershed is thoroughly vegetated and wooded. He described the silting survey which is made very simply and quickly. If the rate of silting is more than 1% of reservoir volume per year doing something about it promptly could be recommended.

Correctives suggested are:

(1) Increasing reservoir size by raising dam.

(2) Gate operation at dam to take off as much flood flow as permissible from the bottom. Where the silt pool piles up at the dam face and will move out while freshly fluid.

(3) Water-shed treatment.

In regards No. 3, Mr. Brown complimented Pennsylvania Water Utilities on the extent of reforestation, resulting in an excellent record for Penna. reservoirs, only three of which showed records exceeding the 1% capacity loss per year. Also in Penna. 4 of the new Soil Conservation Districts have been established. Consideration of the establishment of such districts was urged on the ground of greatest benefits to the greatest numbers.

Mr. Brown related how the studies at Clemson, S. C., had revealed the marked effect on gravity of water which even as little as 10 p.p.m turbidity has, and the consequent travel of silt load from reservoir head to dam along the bottom. Also how bottom gate regulation had resulted in removal of 68,000 cu. ft. of sediment in 9 months.

N. B. Lyle, Vice-President, Scranton Spring Brook Water Co., told how he had been impressed with Mr. Brown's paper before the A.W.W.A. and had persuaded him to survey some of the reservoirs of his company. It had been done and was reassuring to see what reforestation had counted for when considering the loss of less than 0.5% over a period of 48 years of service by the Williams bridge Reservoir on the shed of which 3,000,000 trees have been planted.

L. H. Enslow said that he hoped sometime that Mr. Brown would get a cross section of bottom strata which would reveal the rate of build up before and since reforestation was provided. A possibility in this direction was the York, Pa., reservoir, which had a high silting rate that reforestation must have curtailed considerably.

[If any reader has now, or can obtain, a silting record before and since corrective measures and/or reforestation were introduced we should appreciate the information for publication.—EDITOR.]

"The Effects of Various Pipes and Pipe Linings on Water Quality"—by Paul Weir, Supt. of Filtration, Atlanta, Ga.

Mr. Weir, who was worked triple-time during the meeting, reviewed experiences and results from the Atlanta demonstration and tests of resistance of various pipe materials and linings to corrosive water attack. For his paper on these studies, printed in the A.W.W.A. Journal for September, 1940, Mr. Weir received the Goodell Prize this year in Toronto. We urge our readers to review Mr. Weir's prize paper and see what happens to pipes and water in dead ends and sluggish flow areas on distribution systems. Space in this position will not permit an adequate digest. The methods and equipment employed can be highly recommended to others in the score of practicability and appeal to the run-of-mine water works man. And, that may mean a good deal to other chemists just as it has to Mr. Weir.

One-time Presidents

Jas. G. Dunwoody, Gen'l Supt.
Erie, Pa.

Wm. C. Emigh, City Engr. and Supt.
Coatesville, Pa.

Chas. L. Fox, Gen'l Mgr. and Chief Engr.
Pennsylvania Water Co., Wilkinsburg, Pa.

In brief, the Weir scheme consists of running filtered water from a manifold through 44 pipe specimens in 30 in. lengths in parallel. The rates of flow are 1 ft. in 4 hrs., which is that found on the system for 6 in. pipe in slow flow areas. The degree of corrosion is indicated by the brown iron stain deposited on white glass drip plates. With this exhibit, even if no laboratory analysis had been made to produce the illuminating graphs, it was not difficult for Mr. Weir to show his boss why bituminous impregnated cement lined pipe should be used in Atlanta's system. For service lines, copper tubing.

An interesting disclosure was that the initial alkalinity from asbestos-cement pipe was less than for ce-

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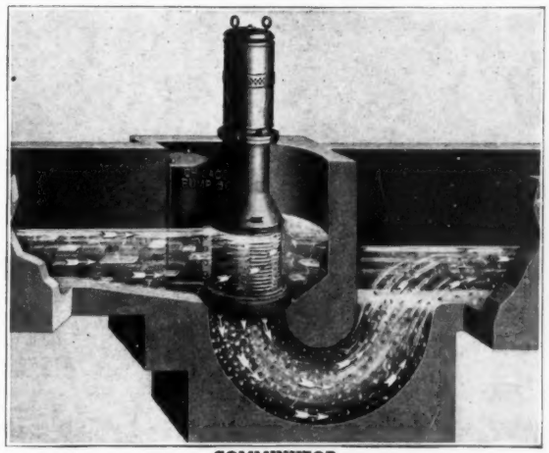

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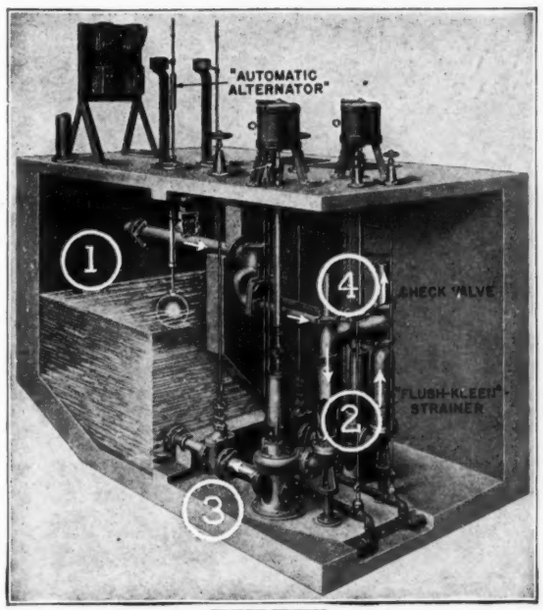
FLUSH-KLEENS can't clog. Solids do not pass through the impellers. Operation is automatic.

FILLING WET WELL

① Sewage flows through inlet pipe.
② Coarse sewage matter is retained by strainer.
③ Strained sewage flows through idle pump to basin.

PUMPING

③ Strained sewage is pumped from basin.
② Coarse sewage matter is backwashed from strainer.
④ Special check valve closes; sewage and coarse matter are pumped to sewers.



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The only cutting pump with ball bearings on both sides of the impeller and built STURDY enough for severe shocks.

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The only pump providing continuous multiple shearing actions all the way through the pump.

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THE FIRST LINE OF DEFENSE

...IN TASTE AND ODOR CONTROL

Just as the airplane has revolutionized military strategy, so AQUA NUCHAR Activated Carbon has reshaped taste and odor control methods in raw water supplies.

The very latest development is the use of AQUA NUCHAR Activated Carbon for "blackout" of algae. Its superior ability to remain in suspension in water for a long period of time prevents the penetration of sunlight to any great depth when it is used in the sedimentation basin. Since sunlight is one of the essentials for algae growth, this important characteristic of AQUA NUCHAR prohibits the propagation and growth of algae by "blacking out" light penetration.

We understand that some of our regular readers of TASTE AND ODOR CONTROL JOURNAL never received the March 1941 issue. Since this issue contained a very interesting article by William T. Bailey, Council Bluffs, Iowa, entitled "Blackout of Algae," we wish to give our readers an opportunity to read this paper. We hope you will check your files, and, if the March issue is missing, write to our nearest office for a copy.

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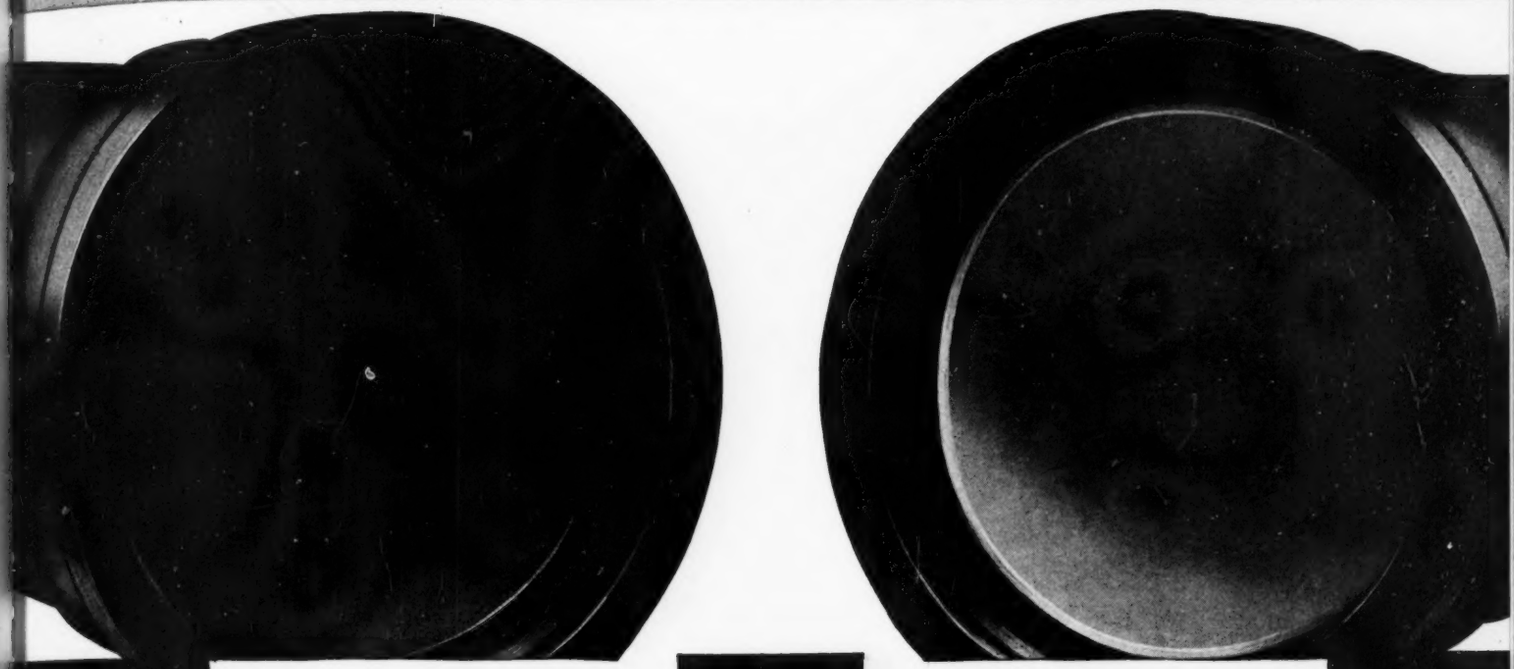

IN MORE THAN 75% OF THE U. S. A.
YOU GET BOTH
with standard tar-dipped cast iron pipe

IN LESS THAN 25% OF THE U. S. A.
TO GET BOTH
use lined* cast iron pipe

100 YEARS of high capacity as a carrier

WHERE TUBERCULATING WATERS MUST BE TRANSPORTED (LESS THAN 25% OF THE U.S.A.) USE LINED CAST IRON PIPE*

The areas of the United States where tuberculating waters materially affect the carrying capacity of pipe represent *less than one-quarter of the total area of the country*. If you are located within one of these areas, use *lined* cast iron pipe. You do *not* have to sacrifice the long life, low maintenance cost and salvage value of cast iron pipe in order to be assured of high carrying capacity throughout the life of the pipe you buy. The Cast Iron Pipe Research Association recommends *lined* cast iron pipe where tuberculating waters must be transported. Lined cast iron pipe is the only pipe that will have 100 years of useful life plus 100 years of high carrying capacity. Send for map which shows approximately 76% of the country where little or no tuberculation is to be expected. Lined cast iron pipe is made in sizes from 1¼ to 84 inches.

Various types of linings are available to meet various conditions and preferences of users

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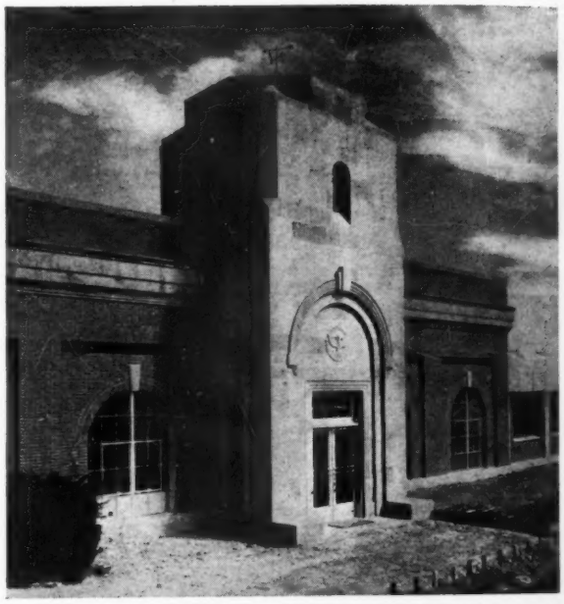
CAST IRON PIPE

Most filter plants which make the headlines are "ROBERTS" EQUIPPED

With the official opening of this modern filter plant we again enlarge our long list of "talked about" installations. The dedication, coincident with the Georgia Waterworks Short School, again invites inspection and discussion of "Roberts" workmanship. As heretofore, and as we pledge ourselves for the future, closest scrutiny will find fulfilled our guarantee of "excellence of workmanship".



1

1. ATLANTA'S NEW FILTER PLANT
   Hemphill Station
   32 MGD Capacity
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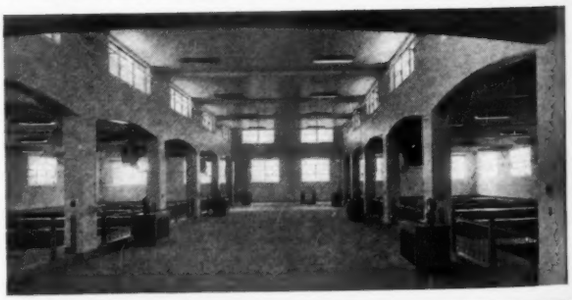


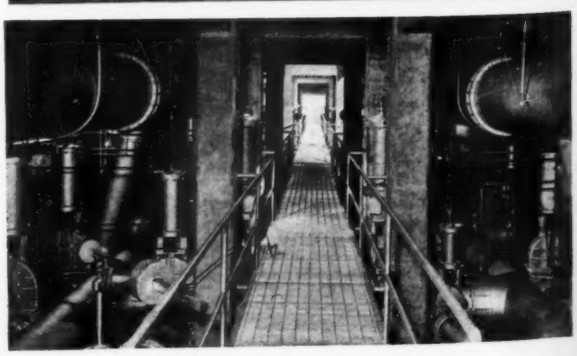
2

2. "The Operating Gallery"

3. An Innovation in Pipe Galleries

   All pipe and specials are of fabricated steel, with Dresser couplings.

   All piping, both inside and outside the plant, formed a part of the filter equipment contract.



3

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ROBERTS FILTER MFG. CO.
607 COLUMBIA AVE.
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This name plate is our pledge of cooperation—of adherence to specifications—of quality of materials —of excellence of workmanship—of continuing interest long after the contract price has been paid.

"Prof." Homer Turner
State College
(Research Engr., Anthracite Inst.)

•

R. B. Adams
Chief Chemist
Penna. Water Co.
Wilkinsburg, Pa.

H. S. Howe
Chief Engr.
Scranton-Spring Brook Water Co.
Scranton

•

Bruce Harkness
Engineer
Tate Pipe Linings, Inc.
Andover, Mass.

M. L. Smith,
San. Engr.,
U.S.P.H.S.
Wilkes-Barre, Pa.

•

C. E. Burlingame
Manager
Berwick Water Co.
Berwick, Pa.

Harry Guest
Filter Operator
and
Leonard Domlesky
Asst. City Engr.
Coatesville, Pa.

J.L. Columbia
Supt. Filtration
Laugeloth Water Co.
Burgettstown, Pa.

•

F. A. Bartoletti
Chemist
East Bethlehem Co.
Frederickstown, Pa.

ment-lined pipes; and that chlorination with chlorine gas is a big help in reducing this objectionable initial alkalinity.

Geo. D. Norcom, Consulting Sanitary Eng., New York City, said that the tendency was still to minimize the importance of protective linings. After some years of observation in connection with newly cleaned mains handling even the milder tuberculating lake waters he considered it unfortunate. He observed that the Atlanta water was lime treated short of the C_aCO_3 saturation point and wondered why? To this Mr. Weir replied that they have an Enslow Continuous Stability Indicator as a guide in treatment and they kept just under the saturation point merely as a measure of caution.

Bruce Harkness, Tate Process Inc., Andover, Mass., pointed out that specification would insure use of the proper cement to avoid such high free lime in the lining.

I. M. Glace, Cons.-Engr., Harrisburg, said that he could understand why Mr. Weir had been going up in his lime application with caution. That was better than an early experience he (Glace) had had when jumping in and adding alkali to the proper theoretical extent. Result was a sudden "tuberculation in reverse" wherein the alkali had caused the tubercules to let go. It seemed to have been a good method of purging but was temporarily a bit hard on customers and company meters. It was still a mystery to him as to why there are pH drops in closed pumping mains.

Later in the meeting Mr. Weir showed a movie of pipe cleaning and lining procedure in Atlanta. Some of the 10,000 ft. and six inch pipe mortar lined pipe was pipe laid in 1870 and is now to be returned to the system in condition better than new, with a C value of 120 as compared to 40 to 50 when the pipe was removed from the system for the centrifugal lining project involving low lime Atlas cement in a 1 to 1 mortar producing ⅛th inch lining as minimum thickness. The clever centrifugal machine was fabricated in the Atlanta Water Dept Shops and had worked splendidly.

Rates of Filtration

"Permissible vs. Reliable Rates of Filtration"—by M. C. Smith, Chief Eng., Dept. of Utilities, Richmond, Va.

Mr. Smith reported on studies made at Richmond, Va., sometime back, looking to the "one most perfect or most efficient" filter sand.

In the end the outcome of these studies was the perfection of raw water preparation, which if properly cared for the matter of sand size and rates has slight consequence.

From the 2 in. diameter glass tube filters to the plant size units the following 3 sands were employed.

	No. 1	No. 2	No.3
E.S.	....0.65	0.53	0.45
V.C.	....1.50	1.45	1.34
Bed Depth	22 in.	21 in.	31. in.

Results showed that No. 1 coarser sand permitted a 3.5 to 4 mgd. rate as compared to 2.5 mgd. for No. 3. The wash-water was likewise less for No. 1 and the 0.65 m.m. bed seemed all around the most suitable size for Richmond, keeping clean on 0.7 for wash water.

Mr. Smith's conclusions were, in choosing the best filter material and filter rates, to secure the best raw water preparation and applied water. Then from this point determine the most satisfactory sand, and it won't make a great deal of difference in many instances.

Carl J. Lauter, Chemical Engr. in Chg. of Filtration, Dalecarlia Filters, Wash., D. C., scheduled discussion, stated that he was of the opinion that any rules made to cover filter rates would have to be very flexible and take into consideration the quality of water and its preparation. Dalecarlia experiences indicate a sand of 0.45 m.m. preferable to finer sand. As to washing a long period high rate bed expansion has let mud-balls sink down into top gravel whereas short washes at more frequent intervals or even 3 brief period washes in succession have been better on the score of keeping the dirt at the top. Taking all into consideration bottom wash alone does not seem sufficient and some form of surface wash seems necessary to do the job thoroughly.

In reply to questions Mr. Smith

Reading left to right: Earle Johnson, District Manager, W. & T. Co., Pittsburgh, Pa.; M. D. Baker, Chief Chemist, W. Pa. Power Co., Springdale, Pa.; Owen Rice, Development Engr., Calgon, Inc., Pittsburgh, Pa.; P. S. Wilson, Consultant, Glen Ridge, N. J.; Bruce Harkness, Engineer, Tate Pipe Linings, Andover, Mass.; "Jo" Acker, Sales Engr., R. D. Wood Co., Philadelphia; Arthur P. Miller, Distr. Engr., U.S.P.H.S., New York; "Bob" Haywood, Supt. Filtration, Chester, Pa., Water Authority.

John Podroskey (Monongahela, Pa.) O. H. Shorlock (Mueller Co., Decatur, Ill.) W. W. Darby (Charleroi, Pa.) Jim Fergus (Supt. West Newton, Pa.)

Poker gets under way with a good gallery.

Musta been of the strip variety. Just look at Simplex's "Bob" McQuade.

Closeup of "Duces Wild" Duckworth figuring while Dawson bumps it. Brock (standing) is trying to help "Ducky" figure it out.

Next morning — "Ducky," poorer but wiser, looks over a good magazine. The others are too small for our "specs" to make out.

stated that Richmond filters are washed at 4 ft. head loss or after 200 hrs. run, whichever arrives first. At Washington Mr. Lauter washes at 2 to 6 ft. loss, the criterion being the first rise of turbidity in the individual filter, such being easily detected in the tell-tale effluent globes.

Jordan on Licensing

H. E. Jordan, Exec. Secy., A.W.W.A., made a quick special trip to State College to talk on **"Operator Licensing—The Good and the Bad in It,"** and made a splendid job of comparing water operation licensing along with that of the medical and legal professions. The one principal argument against such licensing is that the right of home rule is jeopardized. However home rule went by the board when Federal money was passed around. Through various agencies. The other chief argument is that water quality has been improved *without* licensing to the splendidly good record it now enjoys. The final argument is that it is a "racket" to provide security of position and higher salaries for a group who may eventually become more under state control than municipal.

On the other side there is a more convincing picture that some adequate protection is needed to insure no failures in water purification such as has cost Olean, N. Y., Fort Wayne, Ind., and other cities a pretty penny and has cost many others illness and death. When in 1942 major cities are still appointing unqualified men as department heads it is the time to argue louder than ever for public protection and operator protection also—this means mandatory licensing and no mere optional licensing scheme will stop the practice.

As a final question to those fearful of the effects of licensing the following should be put. Why should our young men equip themselves for water supply work when the protected public offers them no form of guarantee that their job will continue beyond the next election year? The only dependable solution to the problem of assuring the younger men a professional rather than a job holding status in the municipal field and compensation in keeping with that for similar services in private enterprise is to establish iron clad licensing acts recognizing competence and qualification first, and insuring continuity of employment at an equitable wage in return for having prepared for the vocation.

Information, Please

With three of the four experts on the panel ex-chairmen of the Water Purification Division of A.W.W.A. and the fourth now vice-chairman and chairman-to-be there was quite a bevy of brains on the rostrum—note no mention of looks. Why? M. C. Smith, Geo. Norcom, Carl Lauter, Paul Weir.

Conducted by Secy. Glace whose experts of last year cost the Association too much money for questions not answered that the panel was fired and the questionners were pulled into the job at less expense to Glace's treasurer paying out 1 buck for each question not answered adequately. This year a single dollar only went out, and judges Brush, Murdoch and Enslow had to go into a huddle to decide whether or not the whole dollar should be paid.

The question costing the dollar was "When swinging from iron and lime treatment over to alum during freshet flows of the stream, why do pop-bottlers have foam troubles in filling bottles?" Anyone who knows the real answer to this one can get it printed by sending it in and the experts may read.

Other questions and answers indicated that—(1) What appears to be more residual chlorine at the bottom of filters than put in on top is in reality manganese coating leaving the sand.

(2) Break-point chlorine dosages may be applied ahead of or following the coagulant. As a rule less is required following formation of the floc. In some instances partial chlorination prior to flocculation will reduce the coagulant cost.

(3) Tubercules are all of the same general nature and composition. They grow less rapidly and are more dense in rapid flow and sluggish flow. Also "Calgon" seems to retard spread of growth.

(4) After reservoir coppering the color increase is due to peptized dead algae and perhaps a copper compound within the dead algae or amorphous matter.

(5) A water of limestone hardness only when softened to zero with zeolite and mixed with lime softened water to produce a product of 150 parts alkalinity and pH of 8 should have no bad effect on zinc coating of hot water tanks, unless excessive temperatures and bumping is allowed.

Murdock on Legal Responsibilities of the Operator

The paper by John H. Murdoch Jr., Councellor, American Water Wks. & Elec. Co., N. Y. City, and President of the Venerable Water Works Association of Pennsylvania (consisting only of privately owned companies), proved all that was expected of it.

Space limitations dictate that we refer the reader who has not already read Mr. Murdoch's splendid paper in our September issue, and the comments on the Editor's page of that same issue, that he make a note to do this without fail. The paper carries a warning of importance to every water utility manager, be the property publicly or privately operated.

RELATION OF METER RATES TO DISTRIBUTION SYSTEM CONDITIONS*

By CHARLES H. CAPEN, JR.
Engineer
NORTH JERSEY DISTRICT WATER SUPPLY
WEST ORANGE, N. J.

MANY efforts have been made to correlate and standardize meter rates so that they will conform to some reasonably uniform pattern. Most of these efforts have proceeded along the line of the standard form of rate schedule adopted by the A.W.W.A. on May 24, 1923, supplemented by a series of reports given in the Journal for September, 1923[1]. This schedule recommended a service charge and three steps: 25,000, the next 225,000 and all over 250,000 gallons per month as the basis for sliding scales. A fourth step was suggested for large cities or cities with industries using large quantities of water.

The above schedule has two fundamental defects. In the first place it works a hardship on those small stores or industries, or even large residences, which use considerable more water than ordinary dwellings, but not enough to be benefited by the second slide or scale. Secondly, it considers the problem only in the abstract without regard for the influence of elevation, type or source of water, type of community served, pumping cost and other related factors. It is the purpose of this paper to outline the net effect of some of these influences.

One of the most common and most important yardsticks used is that of population. Invariably any comprehensive table will show that the cost of water, which ultimately determines meter rates, varies as a function of the inverse ratio of the total population. Figures prepared by Metcalf and Eddy in 1925[2], and by the writer in 1936[3] showed average rates, in relation to population, as given in Table 1.

These two sets of figures are, of course, not entirely comparable, since one is based on meter rates only while the other is based on revenue for all water produced and, therefore, shows the effect of leakage and other waste. Assuming, however, a general loss of 20 per cent between water produced and water recorded by meters, and considering the volume sold to large consumers at low rates, the third column in the table, if adjusted for these conditions, would bear a remarkable likeness to the second column.

The writer has shown that an equation for the relation between Columns 1 and 3 may be written in the form:

$$R = \frac{365}{P^{0.2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where R is revenue in dollars per million gallons and P is population in thousands. It is distinctly noticeable that the figures in Column 3 of Table 1 are about $\frac{2}{3}$ of those in Column 2. Accepting this as an approximation, a relation between meter rate and population may be written in the form:

$$MR = \frac{50}{P^{0.2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where MR is the meter rate in cents per 1,000 gallons and P is the population in thousands.

For comparative purposes, Table 2 shows the ratio of meter rates for various populations based on Equation 2. A town of 5,000 population for instance would be expected to have a rate nearly twice as great as a city of 100,000 and four times as great as a city of 5,000,000 population.

Much time and thought have been given to consideration of equalization of water rates wherever more than one schedule is in use because of elevation. Equalization, as used here, does not mean a leveling of all rates, but rather a proportioning of rates to some justifiable yardstick. To accomplish this in a manner satisfactory to all consumers is by no means an easy problem. The onus of justifying any stand taken is usually placed directly on the shoulders of the water works engineer or superintendent.

It is not difficult to locate instances of rates varying with elevation, but to anaylze them and show their reasonableness is a task of no small proportion. If the truth were known, it seems likely that few high level rates are adequately charged for in proportion to the added cost of service. On the other hand, some supplies, both gravity and pumped, have to pass water through pressure regulating valves to some of the lower levels. Potentially this water costs even more than high level water because of initial and maintenance costs on the regulating valves. A paradox of this kind defies easy explanation.

Because of the availability of figures, the writer has selected a group of rates in northeastern New Jersey as an example. In this area there are 33 sources of supply serving 70 separate retailing agencies. The quarterly bill of each of the retailing agencies was computed for a household of five persons using 40 g.p.d.

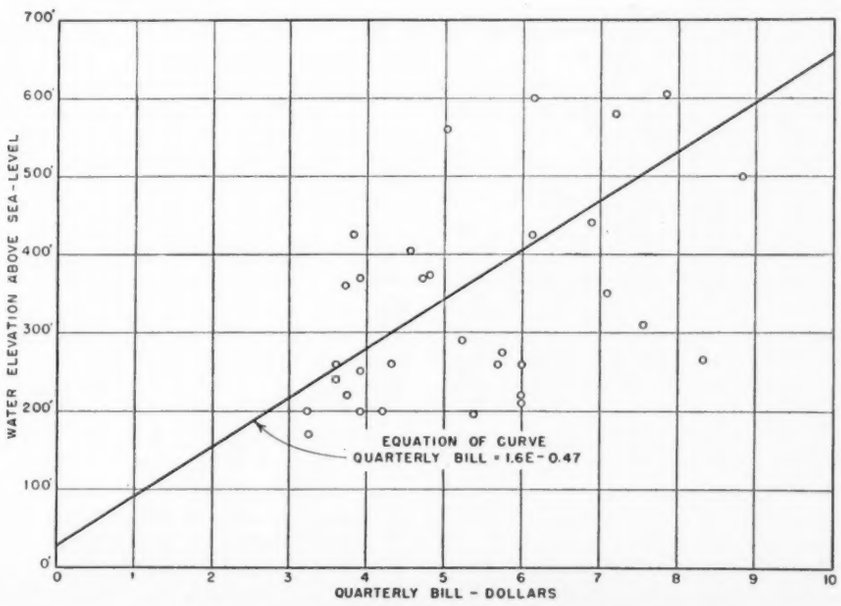

Fig. 1—Relationship Between Rates and Elevations

*A paper read before the Toronto Convention of A.W.W.A. and here reproduced by permission of the Association.

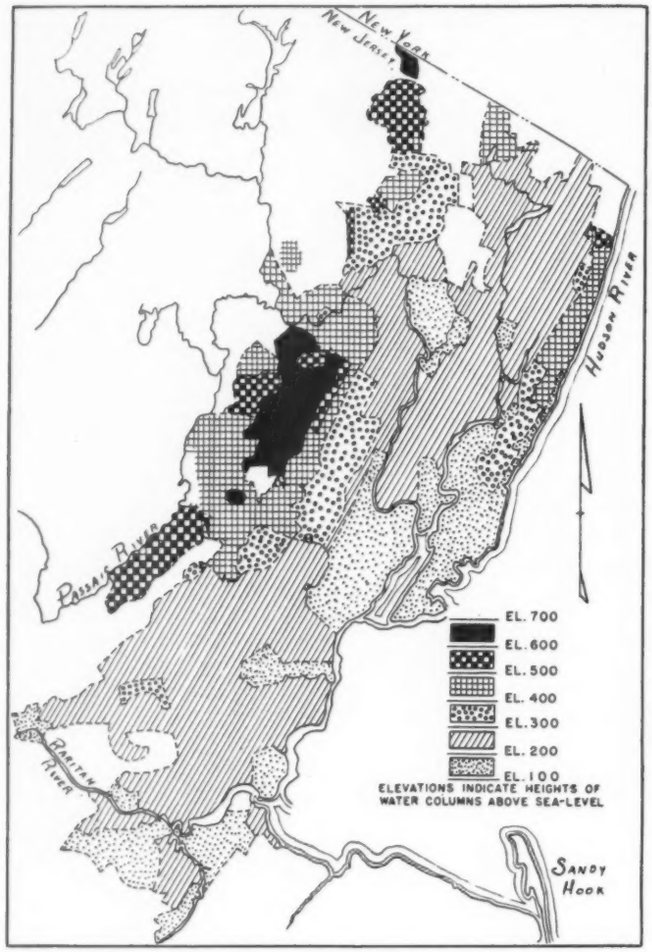

Fig. 2—Pressure Areas

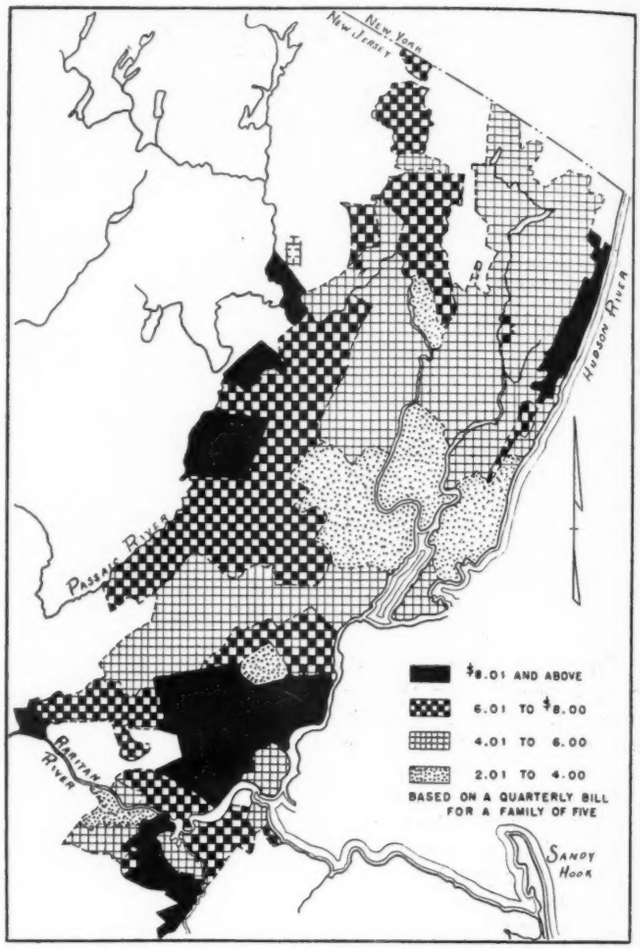

Fig. 3—Water Charges

In Water Supply Systems of Northeastern New Jersey

per capita. These rates were arranged in a table with respect to the elevation at which water was delivered. Solving by the method of least squares, the following equation was obtained:

$$QR = 2.75\ E - 4.12 \quad \ldots\ldots\ldots (3)$$

where QR is the quarterly rate in dollars and E, the delivery elevation in hundreds of feet above sea level.

Omitting all supplies of less than 1 m.g.d. output, the result for 27 retail agencies becomes:

$$QR = 1.6\ E - 0.47 \quad \ldots\ldots\ldots (4)$$

The curve for this equation is shown in Fig. 1. Equations (3) and (4) are not, however, as widely separated in the average part of the elevation range as might at first be supposed. Table 3 gives an idea of the results to be obtained in solving the two equations.

In Table 3 it is demonstrated that, within the elevation range of 300 to 600 feet the approximate increment of cost, for all practical purposes, may be taken to be slightly over $2.00 per quarter per 100 feet of elevation. Since the quantity of water used is 18,000 gallons the increment of cost per million gallons per 100 feet is about $120.00, or $1.20 per million gallons raised per foot. Assuming distribution costs to be half of this, production cost would also be half or $0.60 per million gallons raised per foot. Pumping costs usually vary from a minimum of about $0.05 per million gallons raised per foot, for large supplies, up to $0.25 for small supplies. It follows, therefore, that pumping is not the major part of production cost entering into the elevation at which water is delivered.

The general situation may be more forcefully emphasized by comparing Fig. 2, showing the water level or pressure areas in northeastern New Jersey in 100-foot increments, with Fig. 3, which shows the cost of water based on quarterly bills as previously described. It is particularly noticeable that all of the low priced water is delivered at moderate or low levels while the bulk of the high levels have high priced water.

Except in cases involving long, expensive aqueducts, the location of a supply with respect to the center of distribution has less effect than would normally be supposed. One small municipality in northeastern New Jersey has wells located near its geographical center yet its rates are fairly high. On the other hand, in this same area, a large city, with its source many miles away, enjoys the lowest rate in the region.

The situation may be more clearly realized by taking the cases of cities in the United States serving more than 1,000,000 population. Of these, Boston, Los Angeles, and New York obtain supplies from a distance and their rates are relatively high. Cleveland, Chicago, Detroit and Philadelphia obtain water from nearby sources and their rates are low. Since some of these cities are metered only in small measure, a comparison of meter rates alone is not sufficient for comparison. Examination of the total revenue per million gallons, however, indicates that the large cities which have nearby supplies receive less money per unit volume than those whose water sources are at a distance.

While the rates in cities having a population range between 100,000 and 1,000,000 do not exhibit as uni-

form or as striking a case as the larger ones, it may definitely be stated that in a preponderance of this group too, distant sources of supply are coupled with relatively high rates while nearby sources are generally found to coincide with moderate to low rates.

Perhaps no other phase of water supply is fraught with so much political dynamite and jockeying as the question of how much to charge the little fellow outside the gates. A review of the practice throughout the country reveals widely divergent opinion on procedure. Perhaps one of the best digests of the proper method to evaluate such service was made by the City of Detroit a few years ago. The study revealed the possibility of somewhat inconsistent variations in rates charged to the several suburban areas, and sometimes justifiably so.

There is a general feeling in large cities that consumers outside the political boundary should pay more for their water. An exception exists in Westchester County where New York City sells water at cost delivered to that point, an agreement that was negotiated at the time some of the rights-of-way through the county were obtained. Since this omits the item of cost of the expensive tunnels under the city, the county obtains water for less cost than large consumers in the city. Usually the outsider is willing to pay a reasonable premium but he can hardly be blamed for protesting against paying double the city rate, particularly if his good neighbor just across the "right side" of the boundary line happens to remind him of it on numerous occasions.

One strange anomaly exists in the case of the two municipalities of Garfield and East Paterson in New Jersey. Originally Garfield had wells within its own limits. Wishing to tap a more promising well field, it arranged to establish a larger supply in East Paterson and to sell water at wholesale to the latter. Through its own distribution system, East Paterson now retails water to its citizens at a lower rate than obtains in Garfield. Furthermore, the East Paterson department realizes a profit while the Garfield system operates at a loss.

Recently, several water agencies in New Jersey, who had been competing at destructive rates for the wholesale business of other municipalities, agreed to establish a uniform minimum price of $85 per million gallons. This has gone far to stabilize the water market and to eliminate price cutting.

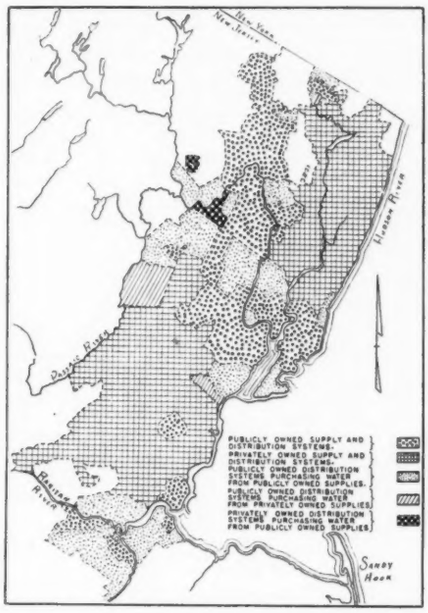
New York
New Jersey
Hudson River
Passaic River
Raritan River
Sandy Hook
PUBLICLY OWNED SUPPLY AND DISTRIBUTION SYSTEMS.
PRIVATELY OWNED SUPPLY AND DISTRIBUTION SYSTEMS.
PUBLICLY OWNED DISTRIBUTION SYSTEMS PURCHASING WATER FROM PUBLICLY OWNED SUPPLIES.
PUBLICLY OWNED DISTRIBUTION SYSTEMS PURCHASING WATER FROM PRIVATELY OWNED SUPPLIES.
PRIVATELY OWNED DISTRIBUTION SYSTEMS PURCHASING WATER FROM PUBLICLY OWNED SUPPLIES.

Fig. 4—Ownership of Water Systems of Northeast New Jersey

Before closing comments on this phase of rate factors, attention should be drawn to the details of ownership shown in Fig. 4. The several conditions shown there constitute a vivid picture of causes for wide variations in rates.

There is so little uniformity in discounts that no general rule or suggestion can be made. The percentage discount and number of days in which it is allowed, both exhibit an exasperating degree of variation that defies comparison.

During the worst day of the depression it became necessary for many municipalities to institute the reverse of a discount — the surcharge. New York City led the way with a 50 per cent increase to most consumers. This has passed the stage of a surcharge and has become a new rate schedule. In large measure it is helping finance the new Delaware River supply. Some question has been raised as to the possibility of the revenue being greater than required.

Other cases of surcharges up to 15 or 20 per cent were frequent. These additional charges were made for the purpose of meeting deficits caused by reduction in use of water, and, hence, revenue, during the depression, as well as to pay for expansion during the late Twenties, the debt service on which did not begin to be felt until the early Thirties.

One of the best arrangements for variations in rates is that in use in Elizabeth, N. J. This city bought its distribution system from the Elizabethtown Water Co. in 1931 and made contracts for purchase of water at wholesale from the company and from the City of Newark. With its supply costs thus firmly established, other costs were cut. Four successive rate reductions of about 5 per cent each were invoked. With a fair degree of stabilization reached, a practice, whereby discounts on bills were made on a percentage basis that did not endanger reserves but reflected earnings, was established. Discounts under this method may vary from time to time. The effect is to make each citizen who pays a water bill feel that he is a stockholder to whom will accrue the profits of a well managed department. The psychological effect is inspiring.

Many private companies were pressed to make rate reductions during the depression. Frequently they were in a position where a surcharge would have been far more welcome. To their great credit it must be said that they have managed very well through a severe financial crisis.

Few water superintendents need to be reminded of the burdensome effect of the large debts incurred during the lush Twenties. The effect of this on rates has already been mentioned under the preceding heading. In most instances the peak debt service has been passed and there is now a financial breathing spell. Surcharges in most cases cannot be relinquished because improvements omitted during the depression now demand attention and funds must be made available to meet the new debt. To put part of the debt service in a municipal budget is not good business. A municipal water department should be just as self-supporting as a private company. Conversely, the practice of milking the water department to keep down the tax rate is just as undesirable. Many meter rates reflect these practices.

In a most comprehensive and informative book on water supplies in the Chicago region, White called attention to 96 metropolitan areas of 100,000 population or over in the United States. The digest of the water supply situation in some of these was outlined and it is evident from the comments contained, and from other information available, that most, if not all, of these areas are troubled with the rate problem. In the Chicago area 168 water systems are listed. Elevations are quite uniform and nearly all supplies are either from Lake Michigan or ground water. Meter rates show variations similar to those elsewhere. One notable exception is the City of Aurora, with about 50,000

people, where the domestic rate is $0.72 per 1,000 gallons, but drops to $0.10 per 1,000 gallons for large quantities. Ratios such as this defy explanation except by those well acquainted with the situation.

Data on many metropolitan areas indicate that most of them would welcome a vigorous and well established body that could adjudicate or regulate rates and other allied problems.

While this paper is intended to present a somewhat comprehensive digest of the topic, many of the remaining factors of influence will have to be considered only briefly and still others of lesser importance omitted. Following are mentioned some of the most important of the factors:

Treatment of Water: Complete treatment of water, including filtration, costs from $4 to $12 per million gallons and generally represents less than 10 per cent of the total cost of water delivered to the consumer.

Density of Population: Cost per connection decreases as density of population increases up to the point where tunneling is necessary to get under other sub-surface obstructions. In this case the cost may start to swing in the reverse direction.

Type of Ground for Mains: Rock excavation for pipe lines is an item that can increase capital expenditures to a great degree and may materially affect rates. Topography has an important bearing. Hilly country makes for higher rates—flat country for lower ones.

Ownership: Private companies must of necessity charge more because of the important item of taxes. Returns to them by the inch-foot or equivalent hydrant rental charge may, and often does, offset much of the tax cost. Necessity of paying dividends is another item in private company operation which tends to raise costs.

Service Lines: Much argument can be invited by discussing who should pay for the service line and meter. There is a great lack of uniformity. It is estimated that this factor affects ultimate cost to the consumer by about 5 per cent.

TABLE 1
Relation of Meter Rates and Revenue to Population

Population Range	Average Domestic Meter Rate Per 1,000 Gal.*	Average Revenue Per 1,000 Gal. Produced†
Over 1,000,000	$0.13	$0.08
250,000 to 1,000,000	.17	.11
100,000 to 250,000	.19	.13
25,000 to 100,000	.22	.17
Below 25,000	.31	.22

* Metcalf and Eddy—based on study of 51 cities.
† Capen—based on study of 165 cities.

TABLE 2
Ratio of Meter Rates for Cities of Various Sizes

Population	Ratio of Meter Rates*
5,000,000	0.46
1,000,000	.63
500,000	.73
100,000	1.00
50,000	1.15
10,000	1.58
5,000	1.82

* Taking rate for city of 100,000 population as 1.00.

TABLE 3
Relation of Quarterly Rates to Elevations in Northeastern New Jersey

Elevation Above Sea Level	Quarterly Rate for 74* Areas	Quarterly Rate for 27 Areas of Over 1 M. G. D. Capac.
200	$1.38	$2.73
300	4.13	4.33
400	6.88	5.93
500	9.63	7.53
600	12.38	9.13
700	15.13	10.73

* Some retail agencies have more than one rate.

Conclusions

As a result of this study the following general conclusions as to influences or conditions under which meter rates normally vary have been reached:

1. Rates are inversely proportional to the 0.2 power of population (see Table 2).

2. Rates are directly proportional to elevation.

3. Rates vary with remoteness of supply, i.e., the nearer the supply, the lower the rate.

4. Consumers living in areas outside city limits pay up to 100 per cent more than those located in the city.

5. Discounts for prompt payment are by no means uniform.

6. Surcharges on bills, invoked during the depression, have in many cases become permanent.

7. Periodic rebates, based on earnings, are the best method of control and management.

8. Water departments should be self-sustaining and should be operated as independently as possible, with meter rates as a foundation of financial practice.

9. Metropolitan areas have in all cases aggravated rate problems. Reasonable regulation in each such area is desirable.

10. Complete filtration increases cost of operation about 10 per cent.

11. Rates vary inversely as the density of population, except in some very large cities.

12. Rates in hilly country are higher than in flat country. The presence of rock also increases rates.

13. Private companies must charge more than municipal departments, largely because of taxes.

14. Consumer-borne costs of service lines should decrease rates about 5 per cent, and vice versa.

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PENNA. SEWAGE WORKS ASS'N.

Features Symposium on Industrial Wastes at 15th Annual Conference

By HARRY A. FABER*
ASSOCIATE EDITOR

With the kind assistance of Chas. H. Young, of Meadville, who responded to an "S.O.S." in the matter of taking notes on early first session papers presented before the writer could reach State College, and did a splendid job of it.—H.A.F.

"Class" at Hydraulics Lab., Prof. Rohlich Demonstrating

MEETING on September 3rd to 5th in the new Electrical Engineering building, where lecture and demonstration facilities are unsurpassed, the Pennsylvania Sewage Works Association held its fifteenth conference at State College.

In welcoming the Association members, Professor F. T. Mavis, Head, Dept. of Civil Engineering, stressed the existing need of educating the general public to the fact that a sanitary engineer is far more than a glorified plumber. He found it a most encouraging sign of progress that the demand for engineers trained in this field has recently exceeded the supply.

Presidents

Geo. P. Searight
Boro Mgr.
Carlisle, Pa.
(retiring)

E. B. Swinehart
Supt. of Plant
Pottstown, Pa.
(incoming)

H. E. Moses, Chief Engineer of the State Health Department, introduced W. H. Wisely, Executive Secretary of the Sewage Works Federation, who spoke briefly concerning the reorganization of the Federation. It has become necessary to make the Federation a self-sustaining group with an effective centralized direction. To accomplish this, increased dues are required in order to derive the costs of business management and other financial assistance in publishing the Journal, long contributed by the Chemical Foundation but which is no longer available. The subscription price of Sewage Works Journal has had to be raised to the actual cost of printing over and above advertising income—namely, just under three dollars per year.

A new type of membership classification in the Federation has been instituted. Not over 50 per cent of the total membership of each member Association may now consist of "low income" members who will pay dues of only $1.50 yearly to the Federation and will receive alternate copies of the Journal (three yearly at the present schedule). Mr. Wisely called attention to the "Operator's Corner," a new section appearing regularly in Sewage Works Journal. This will be filled with practical, usable, down-to-earth informaiton on operating problems. Everyone is invited to contribute papers on plant operation, annual reports, and gadgets for publication in this section.

An amendment to the constitution of the Pennsylvania Sewage Works Association, formally approved at this meeting, makes it possible for the Association to join and support the Federation.

Guest speaker at the annual dinner was Colonel W. A. Hardenbergh, Sanitary Corps, U. S. Army, Washington, D. C., who described in an illuminating manner the complex problems of sanitation which are being successfully solved in our new army camps and in field service..

Lecturer

Dr. H. W. Gehm
N. J. Expt'l Sta.
New Brunswick, N. J.

Sec'y-Treas. since 1940

Bernard S. Bush
State Health Dept.
Harrisburg

NEW OFFICERS

President: E. B. Swineheart, Pottstown.

1st Vice Pres.: T. S. Bogardus, Meadville.

2nd Vice Pres.: M. N. Stiles, Radnor—Haverford Township.

Sec'y-Treas.: Bernard S. Bush, Wilkes-Barre.

Editor: J. R. Hoffert, Harrisburg.

Federation Director: H. E. Moses, Harrisburg.

Laboratory Demonstrations

"Demonstration of Plant Laboratory Control," by Dr. Harry W. Gehm, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Vice-Presidents

T. S. Bogardus
Asst. City Engr.
Meadville, Pa.

M. N. Stiles
*Supt. of Plant**
Newton Square, Pa.

*(*Radnor, Haverford Twshp.)*

Dr. Gehm distinguished between precise methods of analysis and control methods. The latter methods, which were demonstrated, are useful in following the progress of a physical, biological, or chemical process. Sewage treatment, involving all three processes, suffers from a lack of sufficiently rapid control methods.

Of the shorter laboratory tests available for plant control, the most significant demonstrated were: The use of turbidity measurements which provide a rapid substitute for solids determination when occasional accurate tests for solids are made as a check. Use of the oxygen consumed test indicates a relative measure of organic strength of sewage in hours, as compared with the five

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days required for B. O. D. detrminations. Sludge pH may be measured with accuracy sufficient for control purposes simply by diluting sludge 10 to 15 times with distilled water, and by adding indicator solution until the color developed matches standards.

A modified gooch crucible for suspended solids determination and a centrifuge test for estimation of solids in mixed liquor were examples of other rapid control methods. Among simple tests of particular importance in operation of small plants are: Imhoff cone tests, settleability tests, and the methylene blue stability test.

In the discussion following this paper, recognition of the importance of rapid control tests was evident. It was emphasized that truly representative samples are as essential to proper control as the tests; that the end result of laboratory work is not

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Public Works, Doylestown, Pa.

merely an accumulation of figures but the provision of an operating tool; that the chlorine demand test may be utilized as another rapid test for indicating relative organic strength of sewage and effluents, even simpler than the oxygen consumed test.

"Laboratory Demonstration of Sewage Measuring Devices," by Dr. G. A. Rohlich, Assistant Professor of Sanitary Engineering, Pennsylvania State College.

Dr. Rohlich described the hydraulic conceptions which provide a basis for various types of sewage flow measurement devices in common use. By operating small scale models, he illustrated the application of these conceptions. Dr. Rohlich noted the fact that manufacturers of standard equipment issue many worthy booklets and that the useful information contained should be carefully studied by operators.

The design and calculations necessary to measurement of flow by means of weirs was illustrated. The application of Venturi meters and Venturi flumes makes possible the use of indicating and recording devices. A Parshall (Venturi) flume is particularly useful in sewage measurement because it is self-cleaning and because it is inexpensive and results in little loss of head. Following the lecture and demonstration, the "class" inspected many new types of equipment provided in the revamped hydraulic laboratory.

"Sewage Treatment Plants in the National Defense Program." 1. "Design," by E. Sherman Chase, Metcalf and Eddy, Consulting Engineers, Boston, Mass.

In the absence of Mr. Chase, his paper was read by L. D. Matter, Engineer, Penna. Health Dept. Two consulting engineering firms—Greely and Hansen, and that represented by the author—were retained by the Construction Division of the U. S. Army Quartemaster's office to advise in sewage treatment methods for 50 army camps, hospitals, and air fields. Recommendations were based upon simple types of equipment to be provided for temporary camps and more complex equipment for permanent camps.

The general principles to be followed in plant design formed the subject of a technical bulletin and were developed from certain basic data. Items of particular interest in this data are: Design flow is 70 gal. per capita per day of 16 hours, with a maximum rate of 140 gal. per capita per day. No grease traps are recommended, but special facilities for grease removal at the plants are provided. Manually cleaned screens and grit chambers are included. Detention periods in primary sedimentation tanks depend upon type of subsequent treatment; 1.5 hours preceding activated sludge, 3 hours preceding trickling filters, 7.5 hours preceding high rate filters with recirculation and a dilution ratio of 1.0 to 1.5 for single stage filtration.

Imhoff tanks are to be provided with settling capacity similar to that in plain settling tanks, and to have sludge digestion as follows: 2.0 to 2.5 cu. ft. per capita in southern climates, 3.0 to 3.5 cu. ft. per capita in the North. Humus tanks are to be equipped with lines for return of sludge to digester compartments. Low rate trickling filters can be loaded up to a 5,000 population per acre foot in Southern areas and 4,000 in the North. The high rate filters are to be loaded up to 35,000 population per acre foot in the South and 30,000 in the North. Much other data is given in complete detail. All plants are to include laboratory facilities. Probably the most radical departure in these design standards is the adoption of high rate filtration.

"2. "Operation." by Colonel W. A. Hardenburgh, Sanitary Corps, U. S. Army, Washington, D. C.

A few army treatment plants have had skilled operators from the beginning but many have been started by inexperienced men. Civilian operators are being sought by the Quartermaster's Corps, which was charge of plant operations.

A classification has been set up based on the type and size of plants: the degree of treatment is listed as A, B, C, or D, with the latter being the smallest and least complex type of plant. Salary for plant superintendents range, in the same order, as follows: $3,200, $2,600, $2,000, and $1,680.

To date, forty-five army camps have completed plants, three camps

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Chas. C. Agar, Senior Engr.
N. Y. Dept. of Health, Albany, N. Y.

discharge to adjacent municipal plants, and the remainder have some degree of treatment. Of the 45 completed plants, 19 utilize high capacity filtration. There is no essential difference between camp and municipal sewage, according to analytical results. Twenty-four hour composites indicate B. O. D. of camp sewage to be 253 p.p.m. and suspended solids to be 213 p.p.m. average. Excessive grease content is reported at several camps.

Study of flow data for fourteen camps shows average flow per capita per day to be: average, 98 gals.; maximum, 136; minimum, 63. About 80 per cent of the total flow reaches plants between 6 a. m. and 10 p. m.

In discussion which followed presentation of these papers, it seemed of particular interest that the various plants where high capacity filters are employed have not produced the expected degree of purification. M. B. Tark (Link Belt Co.) suggested that regardless of the seeming similarity, camp sewage may easily differ

from usual domestic sewage in "treatability," regardless of analysis.

"Comparison of Various Types of Secondary Treatment," by Frank Woodbury Jones, Havens and Emerson, Consulting Engineers, Cleveland, Ohio.

Devoting his talk more to the philosophy of sewage treatment than to the technique, Mr. Jones explained the reasonable basis for recent trends in methods. While the fundamental understanding of neither the trickling filter nor the activated sludge process has changed, the equipment for operating these treatment methods has been modified in recent years.

Fixed nozzle types of trickling filters are virtually abandoned, giving way to rotary distributors which provide better distribution. The newer developments in activated

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sludge treatment center around refinements in mechanical contrivances. Current studies are directed toward devising the smallest plant which will accomplish the desired result.

The adaptability of various processes was compared with reference to: performance, durability, simplicity, and economy. Since many installations and studies of present processes are very recent, it is too early to reach sound technical conclusions. It is a fact that, under expert operation, older types of plants will produce acceptable results. It seems little recognized that plants largely dependent upon mechanical facilities may be less durable than those not so highly mechanized. Particularly in small towns do mechanized plants present a serious problem of continual maintenance, is Mr. Jones' experience.

J. R. Hoffert, State Dept. Health, Harrisburg, said that operators would appreciate a clear distinction between high rate filters, high capacity filters, bio-filters, etc. In addition to the considerations noted by Mr. Jones, he indicated that many others must be included: capital cost, interest on investment, amortization, convenience and ease of operation, freedom from odors, and efficiency as determined by tests.

"Operation of the Butler Sewage Treatment Plant," by Harold I. Kurtz, Superintendent, Sewage Treatment Works, Butler, Pa.

The Butler plant provides secondary treatment by means of two circular trickling filters equipped with Dorr rotary distributors and is equipped for chemical coagulation utilizing lime and copperas feeders. Because of the present high efficiency of filter operation, it has not yet been necessary to assist biological treatment with pre-chemical treatment. Sludge is digested in a separate sludge digestion tank having a floating cover. Gas is drawn to high and low pressure storage tanks, and is used as power for a gas engine connected to an electric generator. Digested sludge is dried on glass covered sand beds.

Flow meters are supplied to measure volume of settled sewage pumped to filters, to measure filter effluent recirculated, and to measure settled sewage when and if by-passed without secondary treatment. Two Wallace and Tiernan chlorinators are used during the summer for pre- and post chlorination. After describing in detail the arrangement of equipment at the Butler plant, Mr. Kutrz took up operating procedure.

By means of a by-pass installed between the trickling filter and the final settling tank, it is now possible to return an average of 0.8 m.g.d. (out of an average flow of about 2.2 m.g.d.) and thus maintain the filters in constant operation. By this procedure, the chlorinated filter effluent can be used to advantage in controlling growths in the filters. Prior to this method of operation, effluent from the final settling tank was returned. A comparison of "before" and "after" results shows the suspended solids removal to have increased from 76 per cent to 85.3 per cent and the B. O. B. removal to have increased from 87.6 per cent to 93.3 per cent by what proved an extremely simple expedient.

A half-inch water jet is used to wash grit in the screw conveyor above the surface of the grit chamber. This washing has accomplished a 30 per cent reduction of volatile matter in the grit.

During the late winter when chlorination is not available, filter ponding has been relieved by repeated applications of dry lime to the surface of filters. This is done by taking a filter out of service, applying lime, and allowing the filter to rest for one or two days before again operating.

Sludge from the primary clarifier is concentrated for eight hours in a separate tank, supernatant is then drawn off and returned to the raw sewage, before sludge is sent to the digester. An average of 45.8 per cent of the water in the sludge is removed by this procedure. Lime may be added and mixed in the sludge concentration tank before sludge is added to the digester.

Gas collection averages about 1 cu. ft. per capita per day and is sufficient to operate the gas engine at all times. This engine supplies all power requirements except during periods of engine overhaul and repairs; cooling water is used to heat the digester and pump building. Over the first six months of 1941,

L. R. McCoy, Chemical Engr. Diamond Alkali Co., Pittsburgh

T. H. Allison, Supt. Water and Sewerage, Loysville, Pa.

Ralph Carr, Development Engr. Mathieson Alkali Wks., New York

the engine—generator unit supplied a total of electric power equivalent to purchased power costing $1,363. Maintenance and the cost of power during engine overhaul amounted to $336, thus giving a semi-annual saving of $1,027.

Discussion of this paper was opened by John T. Campbell, The Chester Engineers, Pittsburgh, Pa., who noted that the chemical coagulation facilities had previously been provided at the Butler plant and were retained in the new design when secondary biological treatment was added. It is anticipated that chemical coagulation will be used to reduce the load applied to filters as design capacity is approached.

The filter installation was completed in December, 1939, and was immediately placed in service. This proved to be a bad time to start, ice forming on one filter to an extent which necessitated stopping operation. The second filter shortly became overloaded and serious ponding resulted. To cure this, heavy chlorination was tried. The dose was applied by feeding chlorine to reduced flows of settled sewage, while manually revolving the filter distrib-

utor at a slow rate. The high chlorine dose loosened growths and the heavy flow washed slime and solids out of the filter. No further pooling was experienced.

In reply to a question, Mr. Campbell stated that the gas engine cost totaled approximately $6,000—or, because of a 45 per cent PWA grant, the actual investment of the municipality is $3,600. Based on total cost and at the present rate of power saving, the engine will pay for itself in 3 years. Based on actual cost to Butler, the present return will pay for the engine in less than 2 years.

"Operation Results on Sewage Flocculation," by Dr. A. J. Fischer, The Dorr Co., Inc., New York, N. Y.

Some fifty sewage treatment plants employing flocculators are in operation in the U. S. Citing data based on plant results, and referring to particular plants, Dr. Fischer indicated some of the more outstanding accomplishments of this process. The plants mentioned operate without addition of chemicals for coagulation.

Experience at the Denver, Colorado, plant shows that removals of suspended solids increase as the sewage becomes stronger. Continuous return of humus sludge to the flocculator at the Sioux Falls, South Dakota, plant improved clarification of raw sewage. At Ypsilanti, Michigan, studies under conditions of parallel operation demonstrated the improved results due to flocculation.

A number of conditions which are disclosed by the various studies were noted: A flocculation period longer than 20 to 30 minutes is of little value in results attained. The speed of paddles is important, with best results being obtained at a peripheral speed of about 1.6 feet per second. If several speeds are available, a higher speed may prove useful on occasions to increase velocity to a point where the tank may be purged of settled materials. Design of tank outlet definitely affects efficiency (at Sioux Falls, poor results were obtained when an overflowing outlet weir was employed) and low velocity flows must be used to prevent destruction of floc particles.

In summary the author noted also that presedimentation, ahead of flocculation, showed no advantages. In general, flocculation would increase clarifier efficiencies 35 per cent over that obtainable with plain settling. Velocities in channels and outlets following flocculation should be no higher than 1.5 feet per second for best results.

Dr. Gehm (New Jersey Exptl. Sta.), in discussing this paper, called attention to the fact that the extent of purification resulting from chemical coagulation will not be produced by preflocculation alone, but that the results obtained by plain settling are definitely improved when floccaulators are used. His experience agrees with that of Dr. Fischer in respect to higher removals with stronger sewage, that in conjunction with flocculation presettling has little value, and that 30 minutes provides an ample period of flocculation.

C. H. Young described the operation of air flocculation (plain aeration) at Meadville, Pa., where an aeration period of about 6 hours is provided, without return sludge, while the plant is being expanded to include activated sludge treatment. With this bio-flocculation scheme, and settling, a reduction of approximately 50 per cent in B. O. D. is accomplished. Blowers are operated from an engine using sludge gas for power.

To a question, Dr. Fischer replied that preflocculation by mechanical means had in general proved preferable to that utilizing diffused air.

Industrial Waste Treatment

"Symposium on Effect of Industrial Wastes Upon Sewage Treatment Plant Operation." Leader, Christian L. Siebert, Executive Engineer, Pennsylvania Dept. of Health, Harrisburg, Pa.

"Milk Wastes"—W. R. Anderson, Boro Supt., New Wilmington, Pa.

Experience in the handling of waste from two milk plants and a cheese plant in addition to municipal sewage at this small borough, formed the basis of Mr. Anderson's paper. Originally a septic tank—sand filter plant, there is now provided an Imhoff Trickling Filter plant—which provides secondary treatment nine months of the year. A trickling filter, 60 ft. in diam. and 6 ft. deep; a grass filter to act as a strainer and colloider; sludge digestion; sand drying beds; and summer chlorination have been in operation since 1936.

No difficulties in operation of the trickling filter were experienced during the first two years but, as soon as milk and cheese wastes were received, pooling started. While there is a borough ordinance prohibiting the discharge of whey, it is not enforced. A normal sewage B. O. D. of 200 to 300 p.p.m. was raised to 500 to 600 p.p.m with the inclusion of wastes. This resulted in an Imhoff effluent of 735 p.p.m., a trickling filter effluent of 220 p.p.m., and a grass filter effluent of 220 p.p.m. B. O. D.

After improvements were made by better control over discharge of milk solids, by decreasing the volume of processing wastes, and by the addition of chlorination at the sewage plant, better effluent was thereafter obtained. The B. O. D. figures were then reduced to: Imhoff, 315 p.p.m.; trickling filter, 75 p.p.m.; and grass filter, 32 p.p.m. Odors have been something of a problem during spring and early summer months.

Prompt use of chlorine, applied to give a 2.0 p.p.m. residual, generally each night for a week, has reduced slime growths and prevented filter ponding. The addition of lime slurry to Imhoff gas vents has helped to settle sludge solids in this unit. Load on the trickling filter shows improvement when part of the final effluent is recirculated by return to the settled sewage ahead of the filter.

In discussion, Mr. Siebert (Pa. State Dept. Health), noted that municipal authorities must enforce ordinances to prevent plant overloading. Mr. Matter described the pretreatment of cheese wastes by dosing with lime and settling before discharge at New Holland, Pa. Prof. Walker pointed out that lime feed to provide an average alkalinity of 50 p.p.m. in raw milk wastes appeared sufficient to prevent growth of slime in sewers and to prevent acid conditions in the treatment plant. Mr. Siebert said that, within reason, all such industrial wastes should be treated at municipal plants—under adequate municipal control and regulation.

"Steel Pickling Liquors"—L. E. Burnside, City Engineer, Sharon, Pa.

Sewage from a population of 28,000 is treated at the Sharon plant and industries of the town are largely devoted to manufacture of steel. When the plant was remodeled in 1939, steel plants requested permission to discharge wastes into sewer lines and the city agreed to study the possibilities of this. During 1940, the use of acid pickling liquor as a coagulant together with lime or chlorine was investigated.

Analysis show these wastes to average 2.1 per cent sulfuric acid by weight and 5.8 per cent ferrous sulfate by weight. Neutralization of acid alone would require approximately one pound of lime per gallon of waste and the suspended solids produced would more than double those in the regular sewage flow. The Sharon plant is designed to use chemical treatment during periods of low river flow, providing 10 min-

utes of aeration and 20 minutes of flocculation.

Laboratory and plant scale tests proved that an iron dose of 30 p.p.m (with lime) gave results equal to any dose higher. The floc produced was heavy and resulted in a 20 per cent increase in suspended solids removal. When the pickle liquor was oxidized with chlorine, a tough and tenacious floc was obtained, but this proved a more expensive method.

R. D. Hoak (Mellon Institute, Pittsburgh, Pa.), described the variety of means which have been investigated for disposal of pickling wastes. Increasing use of iron salts from this source for water and sewage plant coagulants should follow further research. Manufacture of "Ferron," an insulating material from pickle waste, is utilizing but a small amount of the total production.

"Cannery Wastes" — by C. H. Young, District Engineer, Penna. Dept. of Health, Meadville, Pa.

At the town of Northeast, Pa., wastes from canning of cherries, grapes, and a variety of other foods, has seriously overloaded the local treatment plant. Chemical treatment and chlorination have been of material aid.

Normal sewage flow averages 200,000 g.p.d. and increases to 380,000 g.p.d. with cherry wastes. During this period, raw B. O. D. averages 840 p.p.m. and the final effluent averages 350 p.p.m. Imhoff tanks and trickling filters become overloaded despite the use of pretreatment (screening and lime addition). Up to 1,900 gal. of waste water per ton of cherries packed has been discharged, therefore the canning plants have been requested to provide holding tanks for these strong wastes. Treatment with lime and copperas, using good mixing and settling equipment, gives 60 per cent reduction in B.O.D. (967 p.p.m. to 382 p.p.m.) when doses of 7.5 grains of copperas ($Fe\ SO_4:7H_2O$) and 20 grains of lime per gallon are employed.

Settling of wastes from either cherry or tomato packing does not give material reduction in strength, most of the load must be removed on trickling filters. Coagulation with alum depends on close control of dosage, but will give B. O. D. reductions of up to 50 per cent. Both recirculation of filter effluent and chemical treatment reduces the accumulation of slime on filters.

Chlorination to produce a 5 to 6 p.p.m. residual will accomplish a marked reduction in filter sliming, and is of great assistance in odor control. Final chlorination is used to further reduce B. O. D. and the effluent is now safe to discharge into the stream. Pretreatment of wastes and controlled discharge at all canning plants and further additions at the sewage plant will finally correct all difficulties at the sewage treatment plant.

State Dept. of Health Engineers

(1) F. B. Mulligan, Asst. Exec. Engr. (Harrisburg); (2) S. D. Montagna (Greensburg); (3) Milton Kochin (Williamsport); (4) John Grabowski (Greensburg); (5) Robert Koemer (Greensburg); (6) Joe Barrick, Distr. Engr. (Williamsport).

"Brewery Wastes"—by Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

The fact that brewery wastes contribute disproportionately high loads on municipal treatment plants is not generally recognized. Survey of wastes from 28 breweries in Chicago under Dr. Mohlman's direction indicated that these washes averaged 1200 p.p.m. B. O. D., 600 p.p.m. suspended solids, and 50 p.p.m. nitrogen. Thus. brewery wastes are second only to wastes from packing houses in B. O. D. load. Most authorities believe, however, that such wastes should be handled together with domestic sewage whenever possible.

Little data is available concerning the separate treatment of brewery wastes. The trickling filter plant constructed by the Gulf Brewing Co. at Houston, Texas. has been described. This was selected as the preferred type of treatment after intensive study of several methods. Chemical coagulation is not satisfactory for treatment of brewery waste because most of the materials is in true solution and is removed only by oxidation.

After 18 months of operation of the trickling filter plant in Houston, an average removal of about 90 per cent B. O. D. and 75 per cent suspended solids was reported. Filter flies caused some concern, but were controlled by applying 40 p.p.m. of chlorine for brief duration at intervals to the influent of the primary filter.

In a small town, where a large brewery may cause a high load at irregular intervals, screening and installation of equipment to permit uniform discharge of the waste is essential to permit adequate treatment. One study has indicated some benefit from chlorination of such waste which was treated in an activated sludge type plant.

Chas. Agar (State Dept. of Health, Albany, N. Y.) noted that an installation of the Guggenheim process has been made to treat concentrated wastes from a brewery. The process appars to be satisfactory but no analytical results are yet available.

"Textile Wastes" — by W. H. Corddry, Gannett, Eastman & Fleming, Consulting Engineers, Harrisburg, Pa.

Devoting his discussion to treatment of wastes from silk and Nylon processing, Mr. Corddry described the difficulties encountered in this new field. The greatest problem in silk wastes appears to be caused by the cerecin, a waxy substance on natural silk. This material passes through the primary tank, agglutinates in the primary filter, and drops out in the secondary tank. The resultant sludge is extremely difficult to dry.

The difference between silk and Nylon wastes is of much interest because it appears that Nylon will soon replace most of the silk now processed. Nylon thread has a sizing of polyvinyl alcohol to act as a lubricant, but this material is already oxidized and requires less soap than the wax on silk. One will find wastes to be reduced about 50 per cent with a change to this material.

Silk hosiery mills have used chlorine for decolorizing wastes in pretreatment, and it has been learned that chlorination of the Nylon wastes will coagulate the gums with resultant flocculation. About 3 to 4 pounds of chlorine per thousand gallons of waste changes the pH from slightly alkaline to pH 4.0. The same coagulation and considerable color reduction can be obtained with about 5 pounds of sulfuric acid per thousand gallons. Use of iron salts may be made, but close control of chemical dosage has been found necessary.

Disposal of sludge from either type of waste is still a problem—mainly because of the high soap content, which causes extremely slow drying. Much useful detailed data was made available concerning the characteristics of these wastes, in this comprehensive paper.

Gallons in Drums or Small Tanks

This chart is exceptionally handy for determining the capacity in gallons of any cylindrically shaped container, such as a barrel, drum, small tanks. It also tells the number of gallons in the container at any level.

To use the chart: Find the diameter in inches in the left-hand column and the height of the barrel or tank in inches in the right-hand column. Connect those two points by a straight line and the intersection with the middle column instantly gives the number of gallons.

Thus, for example, the dotted line drawn across the chart shows that if the average diameter of a barrel is 30 inches, and if the height is 40 inches, its capacity is 120 gallons.

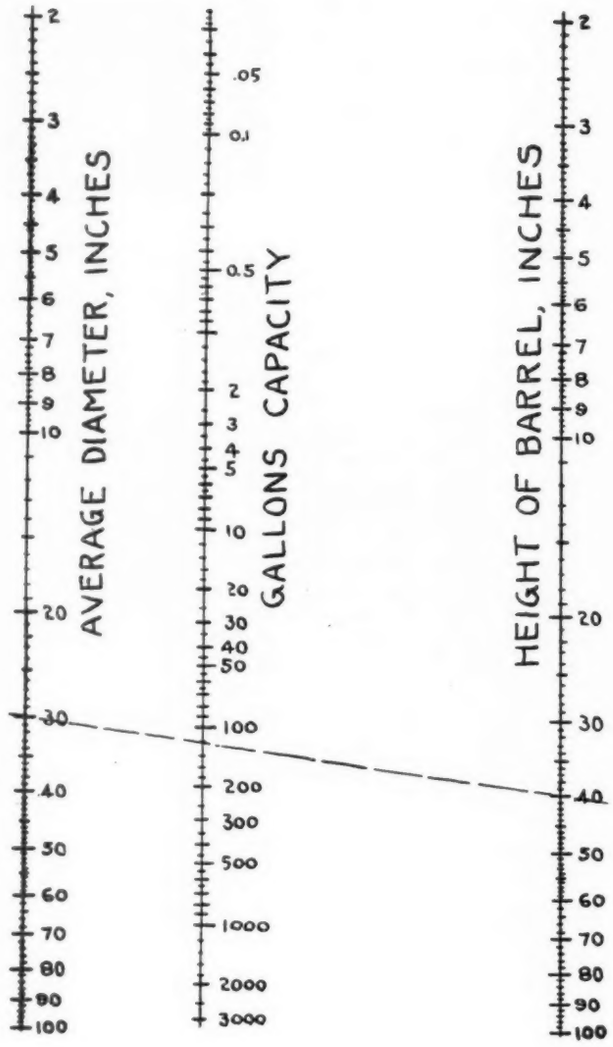
Another valuable thing about the chart is its very wide range. It takes care of all diameters and heights from a can 2 inches deep to a tank 8 ft. 4 in. deep, i.e., 100 in. It is better than a table because it includes an infinite number of combinations. For instance, it will quickly give a hundred answers to this question: "What diameter and height of tank is required to hold 50 gallons?" Here are a few of the answers which I have taken from the chart very easily and quickly. Any of these tanks will hold 50 gallons.

Diameter	*Height*
15 in.	68 in.
20 in.	38 in.
25 in.	24 in.
30 in.	17 in.

Thus in the event that you should wish to build or buy a cylindrical container, figures like the above are useful for determining the least amount of material or the most desirable or economical dimensions required for the desired capacity in gallons.

The chart is also applicable in determining the volume in a well, a riser pipe or any line of pipe when full of water. Knowing the diameter of the pipe the gallonage can be quickly determined for each 60 inches (5 ft.). Divide the length of pipe in question by 5 and multiply the result by the number of gallons found for each 5 ft. of the pipe or riser and you have the answer without need of a much larger chart for the purpose.

*Contributed by W. F. Schaphorst, M.E., Newark, N. J.



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"They Fly Thru the Air With the Greatest of Ease".

At least such is the caption given this snapshot sent in by Tom Cole, Sup't of Filtration at Poughkeepsie, N. Y., who points out that it isn't every snap-shooter who can catch a 20 inch Cast Iron bend so accommodatingly taking a leap from the ground into the trench. But, this is the way they do up at Poughkeepsie because the water is so "kind" to cast-iron pipe and fittings.

Tom shoulda sent this spookish picture in to "C. I. Pipe News" and claimed the V bucks offered for unusual "poses" of cast-iron pipe and fittings. However, last month we went "Life" one better with a picture of water magic; so, this month we say to "C. I. Pipe News"—match this one if you can.—Ed.

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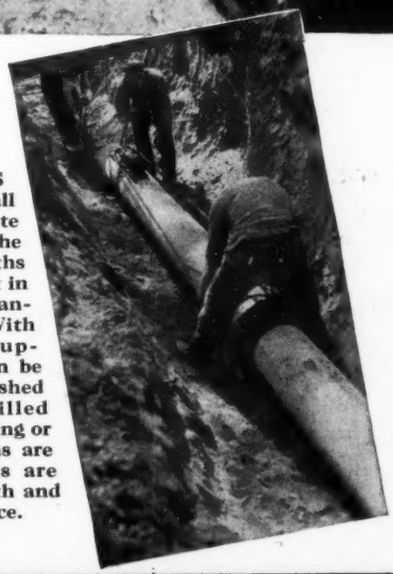

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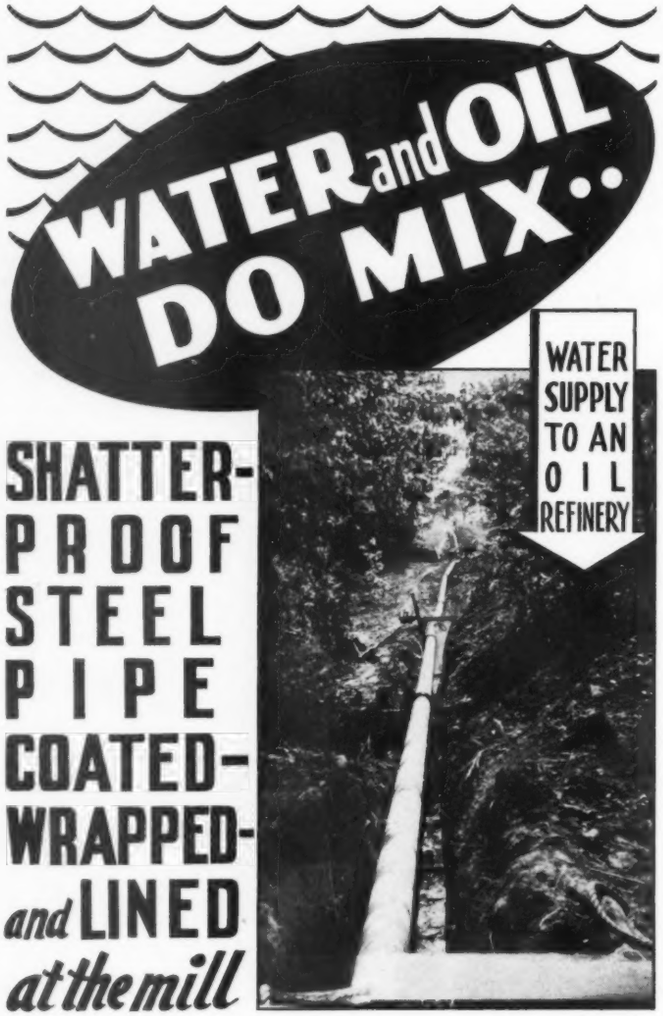

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MEETINGS SCHEDULED

Oct. 16-18—ATLANTIC CITY, N. J.

New Jersey Section A.W.W.A. Secretary, C. B. Tygert, P. O. Box 187, Newark, N. J.

Oct. 16-17—KITCHENER, ONT. (Walper House)

The Canadian Institute on Sewage and Sanitation. Sec'y-Treas., Dr. A. E. Berry, Dept. of Health, Toronto, Ont.

Oct. 20-22—JAMESTOWN, N. D.

North Dakota Water & Sewage Works Conference. Secretary, Wm. J. Nordley, Edgeley, N. D.

Oct. 20-22—CEDAR RAPIDS, IOWA (Montrose Hotel)

Missouri Valley Section A.W.W.A. Secretary, Earl L. Waterman, Prof. of Sanitary Engineering, Univ. of Iowa, Iowa City, Ia.

Oct. 22-25—FRESNO, CALIF. (Hotel Fresno)

California Section A.W.W.A. Sec'y-Treas., G. E. Arnold, San Francisco Water Department, Millbrae, Calif.

Oct. 22-25—ATLANTA, GA. (Georgia Tech)

Annual Water & Sewage School of the Georgia Water & Sewage Association. Director of School, Prof. H. A. Wycoff, Georgia Tech. Ass'n Sec'y, Paul Weir, 1210 Hemphill Ave., Atlanta, Ga.

Oct. — —FORT WAYNE, IND.

Central States Sewage Works Association. Secretary, E. J. Beatty, State Board of Health, Madison, Wisc.

Oct. 23-24—COLUMBUS, OHIO (Hotel Fort Hayes).

Ohio Conference on Water Purification. (21st Annual Meeting.) Secretary, T. R. Lathrop, State Department of Health, Columbus, O.

*Oct. 26-29—NEW ORLEANS, LA. (Roosevelt Hotel)

American Public Works Association. Executive Director, Norman Hebden, 1313 East 60th St., Chicago, Ill.

Oct. 27-29—NASHVILLE, TENN. (Andrew Jackson Hotel)

Kentucky-Tennessee Section A.W.W.A. Secretary H. D. Schmidt, Director Div. of Sanitary Engineering, Department of Health, Nashville, Tenn.

Oct. 28-29—SPRINGFIELD, ILL. (Leland Hotel)

Illinois Water Plant Operators Conference. Secretary, E. Lloyd, Elgin, Ill.

Oct. 30-Nov. 1—MORGANTOWN, W. VA. (Hotel Morgan)

West Virginia Section A.W.W.A. Secretary, J. B. Harrington, Assoc. Engr., State Department of Health, Charleston, W. Va.

*(Change in dates from previous listing.)

MEETINGS SCHEDULED

Oct. 30-31—ROANOKE, VA. (Hotel Roanoke)

Virginia Section A.W.W.A. Secretary, Norman Phillips, Ass't San. Engr., State Dept. of Health, 119 State Office Bldg., Richmond, Va.

Nov. 4—EXETER, N. H. (Exeter Inn)

New Hampshire Water Works Association. Secretary, Leonard W. Trager, State Board Health, Concord, N. H.

Nov. 3-4—PITTSBURGH, PA. (Wm. Penn Hotel)

Engineering Society of Western Pennsylvania (Water Conference). Chairman, H. M. Olson, 171 Longue Vue Drive, Mt. Lebanon, Pittsburgh, Pa.

Nov. 3-5—HIGH POINT, N. C. (Sheraton Hotel)

North Carolina Section A.W.W.A. and
North Carolina Sewage Works Association. Secretary, R. S. Phillips, Box 1170, Durham, N. C.

Nov. 6-7—BALTIMORE, MD. (Lord Baltimore Hotel)

Four States Section A.W.W.A. Secretary, Lloyd Nelson, U. S. Pipe and Foundry, Broad and Chestnut Streets, Philadelphia, Pa.

Nov. 6-8—COLUMBIA, MO.

Missouri Water and Sewage Conference. Sec'y-Treas., W. A. Kramer, State Board of Health, Jefferson City, Mo.

Nov. 13-15—DAYTONA BEACH, FLA. (Osceola Hotel).

Florida Section A.W.W.A. Secretary, Professor A. P. Black, Department of Chemistry, University of Florida, Gainesville, Fla.

Dec. 10—BANGOR, ME.

Maine Water Utilities Association. Secretary, Earl A. Tarr, Winthrop, Me. (Next Bi-Monthly Meeting, Feb. 11, Portland, Me.)

Dec. 30—NEW YORK, N. Y. (Hotel Commodore)

New York Section A.W.W.A. (Winter Luncheon Meeting.) Secretary, R. K. Blanchard, 50 West 50th St., New York, N. Y.

June 21-25—CHICAGO, ILL. (Stevens Hotel)

American Water Works Association. (62nd Annual Convention.) Executive-Secretary, Harry E. Jordan, 22 East 40th St., New York, N. Y.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Water Works & Sewerage, published Monthly at Chicago, Ill., for Oct. 1, 1941.

State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edward S. Gillette, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Water Works & Sewerage and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Gillette Publishing Co., 330 S. Wells St., Chicago, Ill.

Editor—L. H. Enslow, 155 E. 44th St., New York, N. Y.

Managing Editor—John Cecil Black, 330 S. Wells St., Chicago, Ill.

Business Manager—Edward S. Gillette, 330 S. Wells St., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

L. H. Enslow, 155 E. 44th St., New York, N. Y.

Gillette Publishing Co., 330 S. Wells St., Chicago, Ill.

H. P. Gillette, 330 S. Wells St., Chicago, Ill.

LaVerne Louer Hellyer, 3120 Kingman Blvd., Des Moines, Iowa.

Winifred Gillette, 1125 Oak Grove Ave., San Marino, Calif.

Mrs. R. W. Hume, 303 S. Stone Ave., La Grange, Ill.

Provident Trust Company, 17th and Chestnut Sts., Philadelphia, Pa.

Louis Forsythe, 13 E. Windemere Terrace, Lansdowne, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or ather securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is —. (This information is required from daily publications only.)

EDWARD S. GILLETTE.
Business Manager.

Sworn to and subscribed before me this 30th day of September, 1941.

(Seal)

KITTIE C. WOULFE.
Notary Public.
(My commission expires Feb. 8th, 1942.)

LITERATURE AND CATALOGS

Air Compressors—by Gardner-Denver are presented in a comprehensive bulletin from Gardner-Denver Co. of Quincy, Ill., devoted to many styles and mountings of Two Stage Water-Cooled Portable Compressors, built by America's oldest producer of high speed vertical water and air-cooled compressors. Pictures reveal various models of these portable utility units on dam construction, sewer and water trenching, and maintenance and repair jobs. There are gasoline and Diesel powered models on plain and pneumatic wheeled mountings. A tabulated two pages of specifications covering all models appears and a section discusses the advantages of the water-cooled compressor over air-cooled units in respect to efficiency and lubricating oil requirements. Gasoline engine driven units are equipped with the well known Buda engine and Diesel units with Caterpillar engines. A snappy "W. B." portable mounted on an automobile chassis and owned by the El Paso, Texas, Water Dept. would make most any water works superintendent envious.

An accompanying bulletin is specifically devoted to the two-wheel trailer model ABY-85 general utility unit capable of delivering 85 cu. ft. of air per minute under 100 lbs. working pressure.

For copies of Bulletins PC-11 and ABY write Gardner-Denver Co., Quincy, Ill.

"Sewage Gas for Power"—Any reader knowing the author of "Sewage Gas for Power" will wish to read his story. Picking up Crane's *"Valve World"* for July and August, 1941, published every second month by Crane Co., of Chicago, on page 127 we ran into the above named article by Walter A. Sperry, Supt., Aurora (Ill.) Sanitary District. An inclusive schematic diagram of a typical gas production, handling and utilization system, with each unit properly tagged, adds much to Mr. Sperry's story. The article describes the progressive development of power at the Aurora plant, which now has completed its program of gas engine installations, putting the plant in position to be wholly self-supporting in respect to heating and power. Fact is, Aurora completely severed all outside power connections almost one year ago and has so operated since. *"Valve World"* frequently contains articles and how-to-do-it items of interest and value to water works and sewerage engineers and operators. Our recommendation is that you ask to be put on the mailing list. Write Harry L. Delander, Editor, *"The Valve World,"* Crane Co., Chicago.

Diaphragm Type Valves—by Hills McCanna are the subject of a new and comprehensive catalog just produced by Hills-McCanna Co. The catalog illustrates and describes the principal features of the Diaphragm Valve—long known as the Saunders Patent Valve—which has proven a highly successful, trouble free valve in water and sewage treatment plants. Its principal feature is the diaphragm, which separates corrosive and abrasive liquids from all working parts of the valve. The catalog contains all necessary factual data and specifications; also a complete list of service recommendations. Copies of the 1941 Diaphragm Valve Catalog may be had by writing Hills-McCanna Co., 3025 Western Ave. (North), Chicago, Ill.

THREE ESSENTIALS for LASTING PIPE PROTECTION

most ferrous pipe must be COATED TO RESIST CORROSION

More than 25 years' experience shows that most types of ferrous pipes break down when exposed to the destructive action of soil corrosion. Such pipes give low-cost service only when protected with a corrosion-resistant coating.

coatings must be WRAPPED FOR REINFORCEMENT

The toughest coating can be seriously damaged by soil stresses and earth loads. To keep maintenance from becoming a problem, the coating must be shielded or reinforced with a durable wrapping.

the best wrapping is ASBESTOS PIPE-LINE FELTS

Made of asbestos fibers—inorganic and non-tubular—J-M Pipe-Line Felt cannot support capillary action. Strong and durable, it effectively prevents distortion and abrasion of coatings. Its high corrosion resistance assures efficient protection for coatings—minimum upkeep costs.

• • •

YOU'LL BE INTERESTED in learning how J-M Asbestos Pipe-Line Felts add years to the life of pipe under any service conditions. For details, write Johns-Manville, 22 E. 40th St., New York, N.Y.

JOHNS-MANVILLE JM
ASBESTOS PIPE-LINE FELTS

Here's the Modern Way to Clean Sewers—

Just three simple steps—when you use FLEXIBLES. Eliminate 95% of all sewer dig-ups. Save thousands of dollars. Cut out the back-breaking toil and the useless grief.

Many cities claim important savings and say that FLEXIBLES pay for themselves on the first few jobs.

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CLEAN ALL YOUR SEWERS ONCE EACH YEAR

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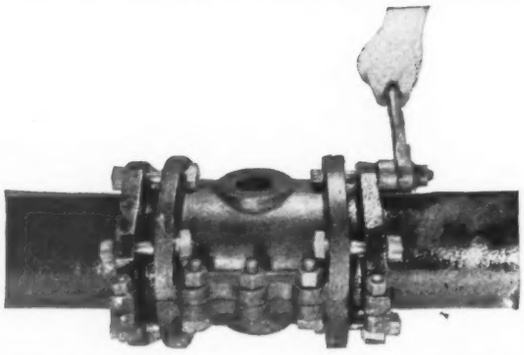
PREPARE NOW
for Winter Emergencies



STOCK UP WITH IMPROVED DOUBLEX SIMPLEX SPLIT SLEEVES

When Jack Frost starts playing around, you will need some of these improved sleeves for quick, economical, effective repair of broken mains. Keep several of different sizes on hand and avoid costly delays during cold weather. On the market for 12 years and many thousands in use. Order now!

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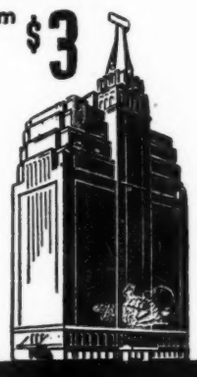

IN THE CENTER OF MID-TOWN NEW YORK

Flow Meters—by Cochrane—is a handsomely produced 52 page catalog which is in reality a handbook on the application of flow meters of the orifice type in measurement of air, gases and fluids. Considerable space is devoted to the importance of flow records in improving operating efficiencies. Thorough descriptions of important operating details are given on ten different types of instruments including the new "Linameter," the ring-balance meter for low-pressure air and gases, electrical and mechanical weir meters, and liquid level instruments. The construction features of the friction-free electric flow meter and the high-torque mechanical flow meter are explained in great detail with full-size illustrations of these instruments showing the high readability of the 12-inch chart record, indicating scale, and totalizing integrator.

Special sections are devoted to control applications, dual range recorders, detached instruments, and summation meters. A list of available charts, with tabulated descriptions of each, is included as a guide to Cochrane meter users. For a copy of "Flow Meters" (Publication 3010) write Cochrane Corp., 17th Street and Allegheny Avenue, Philadelphia, Pa.

F-M Horizontal Short - Coupled Pumps—are distinctly and distinctively new. This new line of pumps for low head service is announced in a bulletin from Fairbanks-Morse and Co. Designed specifically for open discharge rather than delivery against high heads of pipe lines, the pump is so constructed that no bearings in the pump proper are required. The motor bearings, grease packed at the factory, require a minimum of attention. The impeller position may be readily adjusted at will by simply loosening set screws in the bronze shaft collar and shifting the shaft. Thus can adjustments be made to decrease clearances caused by wear in pumping gritty liquids such as raw water and sewage. The full efficiency can be restored at any time. A feature of interest is the semi-trash impeller design, making the unit ideally suited to pumping sewages or water containing debris. Driving these short-coupled compact units is the famous F-M motor with the Copperspun Rotor. For Bulletin 6720X (the figure No. of the new pump and motor unit), write Fairbanks, Morse and Co., 600 South Michigan Blvd., Chicago.

Prepare for Emergency with

VALVES
HYDRANTS
AND
WATER WORKS
ACCESSORIES

As a part of National Defense Program, many water works are installing more valves and hydrants than normal, also keeping larger stock of extras for emergency. M & H Products are well known for high quality and expert workmanship, have been widely used for many years.

M & H PRODUCTS INCLUDE

Fire Hydrants
Gate Valves
Tapping Valves
Wall Castings
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Shear Gates
Mud Valves
Valve Boxes
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Sludge Shoes
Flange and Flare Fittings
Flanged Fittings
R & S Fittings
Cutting-in Tees

VALVES: A.W.W.A. type, iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square Bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL (shown at left) is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

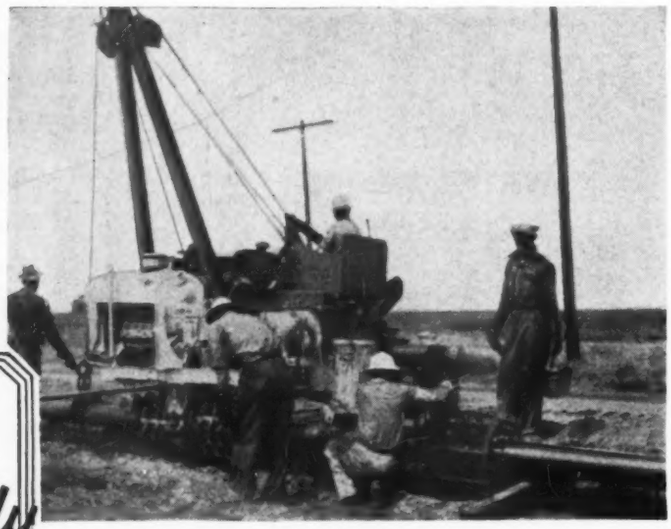
M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

Revised "Flexo-Pac" Price List—From The Eclat Rubber Co. has come a mailing piece which carries a new price list covering the sanitary rubber jointing yarn substitute "Flexo-Pac." Thereon are listed the sizes of the wedge and round types of "Flexo-Pac" for various pipe sizes and the quantity of the packing required per joint. Directions of how to order and use the material are also given. Accompanying the new price list are several reproduced testimonial letters received from satisfied superintendents and managers who have used "Flexo-Pac"—the cleanly and sanitary rubber jointing material, conceived and developed by Hayes Kuhns of Killbuck, Ohio. For further details write Mr. Kuhns or The Eclat Rubber Co., Akron, Ohio.

A Water System Manual for the small home owner as well as the farm or estate owner, has been produced by Fairbanks, Morse & Co. The complete title of the new book is "Manual on the Selection, Installation and Operation of Home Water Systems," which pretty much tells the story in itself. The manual was designed to serve as a guide to those purchasing or installing small water supply systems. The manual is profusely illustrated and picturizes the right and the wrong way of making small pump and pressure tank installations. It strikes us that here is a very useful manual for state and county sanitary engineers. For a copy write Fairbanks, Morse & Co., Chicago, Ill.

"Tricosal" is the trade name of a dispersing agent for concrete-mortar and cement mixes described in a folder from the Eastern Tricosal Co. of New York City. "Tricosal" is a neutral liquid containing certain modified protein derivatives which, added to cement (ratios of ¼ to ½ pound to the sack), exerts a strong dispersing effect on the resultant mortar and thus promotes speedy and thorough hydration of the cement granules with a minimum of water added. The folder describes the particularly beneficial results attainable through use of this dispersing agent at slight added cost. These include greater uniformity and workability, shrinkage prevention, increased waterproofness, permissible water reduction in mixes, and high density of poured sections. In current mortars "Tricosal" eliminates the need for lime and its inherent after effects on mortar. For a copy of the folder which lists and pictures typical jobs and important firms which have employed or approved use of "Tricosal," write Eastern Tricosal Co., Inc., 101 Park Ave., New York, N. Y.

"How to Get Along with Less Priority Metal" is the timely and vitally important theme adopted by Metallizing Engineering Co. in the most recent issue of "Metco News." This 16-page book shows how it can be done with the metal spraying process—especially in the production and maintenance of rotating and reciprocating mechanisms. Many actual instances of unusual savings, not only in metal but in time and money as well, are described in detail and illustrated with photographs and diagrams. For a copy write Metallizing Engineering Co., Inc., Long Island City, N. Y.



Reilly COAL TAR PRODUCTS

REILLY Pipe Coatings Are TIME-TESTED

• The best laboratory in which protective pipe coatings can be tested is "Mother Earth" herself. No other test can possibly be so positive and assuring—and it is from examinations of pipe, coated with REILLY PRIMER AND PIPE ENAMEL, and installed many years ago, that our claims for these products are made. The ability of REILLY coatings to stand up under various conditions of soil—and under wide extremes of temperature variation has been amply proved.

Ease and convenience of application and comparative low cost are other considerations which are responsible for the constantly growing preference for these products. Write for literature.

REILLY TAR & CHEMICAL CORPORATION

Executive Offices: Merchants Bank Building, Indianapolis, Indiana

2513 S. DAMEN AVENUE, CHICAGO, ILLINOIS 500 FIFTH AVENUE, NEW YORK, N. Y. ST. LOUIS PARK, MINNEAPOLIS, MINN.

FIFTEEN · PLANTS · TO · SERVE · YOU

NOTICE OF SALE OF EQUIPMENT

The City of Lewiston, Idaho, offers for sale the following used equipment:

1—450 H.P. GENERAL ELECTRIC motor directly connected to 2800 g.p.m. centrifugal pump, approximately 375 ft. head.

2—150 H.P. WESTINGHOUSE motors directly connected to 1600 g.p.m. Byron-Jackson centrifugal pumps, 255 ft. head.

Starting equipment for motors.

Equipment will be available on or about November 1, 1941.

Full description and particulars can be obtained from

W. P. Hughes, City Engineer,
Lewiston, Idaho

Worthington Air Conditioners are announced as a complete air conditioning system in one compact package for offices and other not-too-large rooms for such unit type conditioners. The neat chassis contains a Freon water cooled refrigerating machine designed for minimum water consumption with automatic regulating valve to govern water flow to exact requirements. For the detailed description and specifications concerning this unit, write Worthington Pump and Machinery Corp. (Carbondale Div.), Harrison, N. J.

PAINTING DAMP WATER PIPES

In reply to a question regarding the painting of plant piping which is wet from condensed moisture and can not be taken out of service long enough to dry, The New Jersey Zinc Company prints the following in its periodical, "Paint Progress." The engineer, by the way, stated that wiping the pipes with dry rags before painting had not been satisfactory.

Says New Jersey Zinc:

"We have seen good results obtained by using a turpentine wash to replace the moisture on the pipes and have, as a result, adopted the following method in our own plants:

"The surface is prepared for painting by removing the loose paint and scale by wire brushing and scraping. The dirt and excess moisture are then wiped off the surface and a liberal coating of turpentine is applied.

"The turpentine has a two-fold effect: first, to replace the water remaining on the surface, by virtue of its preferential wetting property, and second, to 'lift' any loose rust scale remaining on the surface after the mechanical cleaning. A primer coat of standard Zinc Dust-Zinc Oxide paint is then applied directly on the turpentine wet surface, thus providing the necessary rust inhibitive coating. In actual practice, a considerable interval may be allowed between the application of the turpentine and the primer, since the turpentine prevents further condensation of water on the steel.

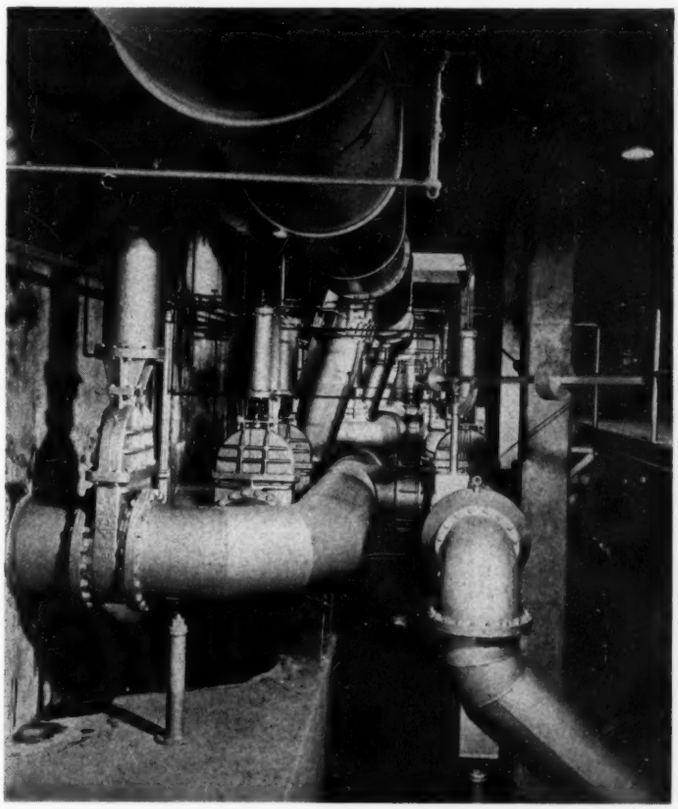
"Brush application of the primer is preferred to spray application, since it insures the intimate contact of the Zinc Dust with the surface. An 80:20 Zinc Dust-Zinc Oxide formula with a linseed oil vehicle has been used, but a synthetic vehicle, such as phenolic, may be preferable, first, because of the more rapid drying of the synthetic resin formulation, and, second, because of the improved water resistance of the film.

"The usual drying interval is allowed after which the finish coat paint is applied. Just before the application of the second coat, the moist surface is again wiped with turpentine, but care must be taken to avoid an excess of the turpentine, since it might soften the surface of the primer.

"Either an 80:20 Zinc Dust-Zinc Oxide paint or other suitable metal paint may be used as the finish coat. Colored Zinc Dust paints are available for finishing coats where a distinctive color scheme is desired.

"It has been found that kerosene may be substituted for turpentine to replace moisture on the pipes, but its action is much slower and its assimilation into the paint less positive."

COLE



• **WELDED STEEL PIPES**
Selected for **ATLANTA'S NEW FILTER PLANT**

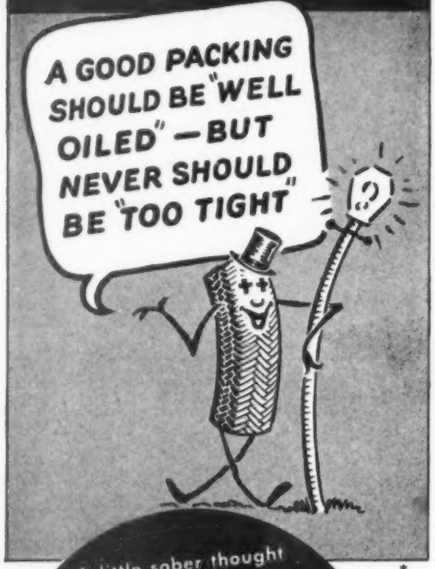
All pipe in filter gallery, outside and underground, sizes ranging from 8″ to 48″, were fabricated at our Newnan plant and delivered by truck to the job without delay—another demonstration of COLE service.

Other COLE products include tanks of all kinds, metals, shapes and capacities for all purposes, welded and riveted. Made to your specifications, or from designs submitted by your own engineering department.

TANK BUILDERS FOR OVER 80 YEARS!

R.D.COLE MFG.CO.
Established in 1854
NEWNAN···GEORGIA

PALMETTO PETE says . . .



A little sober thought will show that continuous lubrication makes packing last longer. A test will prove it! Write for a

FREE working SAMPLE

today. Just send name, address and specify service conditions and size of packing

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PALCO® PACKING stays SOFT

One of the secrets of Palco's extra long life is the special lubricant impregnated in every strand before braiding. This reserve supply deep in the heart of the packing keeps the contact surface continuously supplied. As a result, Palco stays soft, does not require frequent tightening, and lasts from two to three times longer than ordinary packings. Try Palco—you'll find you'll save both time and money.

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PALMETTO
for steam, hot water, air. PALCO *for water.* PELRO *for oils.* CUTNO *for alkalis.* SUPERCUTNO *for acids.* KLERO *for foods, etc.* PALMETTO SUPERSHEAT
PACKINGS

9 out of 10 who try them, buy them

EQUIPMENT NEWS

More Accurate pH with Taylor Water Analyzer

● The Taylor water analyzer, which was designed primarily for the determination of color, total iron, manganese, chlorine, nitrogen, nitrite, nitrate and silica in water, has now been adapted to the determination of pH. This adaptation makes available one simple and economical outfit for all these determinations. The methods employed are those given in Standard Methods of Water Analysis (A.P.H.A.). The color standards are enclosed in plastic slides and all standards carry an unlimited guarantee against fading.

While the regular comparator method gives accurate results on waters which are rather highly buffered, considerable difficulty has previously been experienced in determining the pH of distilled water and slightly buffered waters. This is due to the fact that all indicator solutions are of necessity buffered to some extent and when in the comparator method 0.5 cc of indicator solution is added to 5 or 10 cc of sample the result obtained may be higher or lower than the true value, that is, somewhere between the pH of the indicator solution and the true pH of the sample. This also explains why different results are sometimes obtained when testing a water with two indicators whose ranges overlap, such as bromthymol blue (pH 6.0-7.6) and phenol red (pH 6.8-8.4). Bromthymol blue solution is adjusted to its midpoint 6.8 and phenol red to 7.6. If, therefore, a slightly buffered water whose true pH is 7.0 is tested with bromthymol blue, the reading will be 7.0. When, however, phenol red with a pH of 7.6 is added the reading may be anywhere between 7.0 and 7.6.

With the Taylor Water Analyzer the proportion of indicator solution added (0.15 cc) is so small as compared with the volume of sample (22.5 cc) that the effect of the pH of the indicator solution is practically eliminated and the same results will be obtained with both bromthymol blue and phenol red.

For further information write W. A. Taylor & Co., 7300 York Road, Baltimore, Md.

IF Your SEWAGE effluents are high in suspended solids;

Or, you have a WATER PROBLEM;

Or, desire to RECOVER a product now wasted;

Or, you are disturbed by STREAM POLLUTION;

Or, are in any way interested in the removal of suspended solids from liquors;

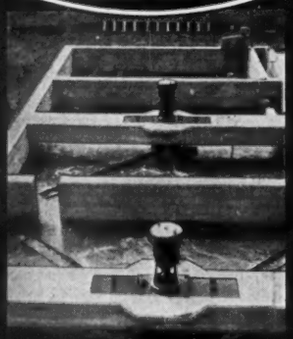
You should investigate the

Laughlin Modified Rapid Sand Filter

BECAUSE, it is a simple automatic, continuous flow apparatus, designed on familiar lines, to accomplish a purpose without adding to the operator's troubles.

LAUGHLIN EQUIPMENT CORPORATION
270 Madison Ave., New York City

AER-O-MIX
AERATOR - MIXER



Down-Draft Type MECHANICAL SEWAGE AERATORS

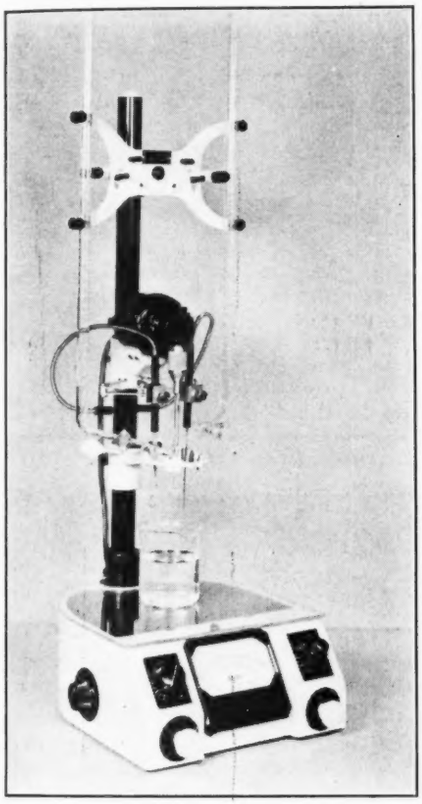
Write for information on AER-O-MIX for your SEWAGE or WATER TREATMENT APPLICATION.

VOGT MFG. CO.
INCORPORATED
P. O. Box 1122 Louisville, Ky.

Leitz Electro-Titrator

● The Leitz "G and D" Electro-Titrator was developed by Drs. Garman and Droz for making titrations involving dfficult end points on obscured indicator colors, in oxidation-reduction titrations, precipitation titrations, and even in determining pH values. It is readily seen that this instrument is a powerful tool in research.

The Leitz Titrator provides, in a single, self-contained and compact unit, a highly stable and sensitive vacuum-tube voltmeter combined with a convenient titrating stand which is readily portable. The stand provides a stirring motor, beaker holder, adapters for electrodes, bunettes, and all other needed accessories. Thus the Electro-Titrator is complete in itself, with all electric equipment (including batteries) assembled in the large base of the instrument.



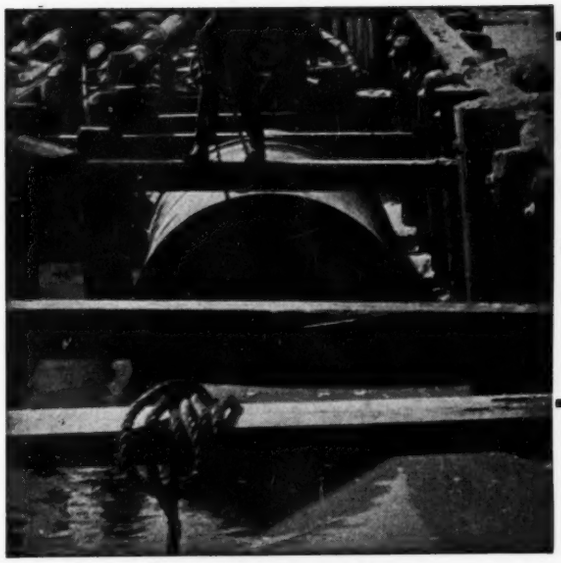
Space available here necessitates this scanty description and picture. Anyone interested in this high class instrument and all that it will do, its manipulation, cost, etc., should request the illustrated booklet which goes very thoroughly into the Electro-Titrator. For a copy write E. Leitz, Inc., 730 5th Ave., New York City.

Improved Model Evaporative Coolers

● The demand for engine jacket water coolers of low purchase cost plus low operating cost has been answered by Fairbanks, Morse & Co., who have developed new and improved models of evaporative type coolers.

This device, considered to be the

(*Continued next page*)



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

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In the Spotlight

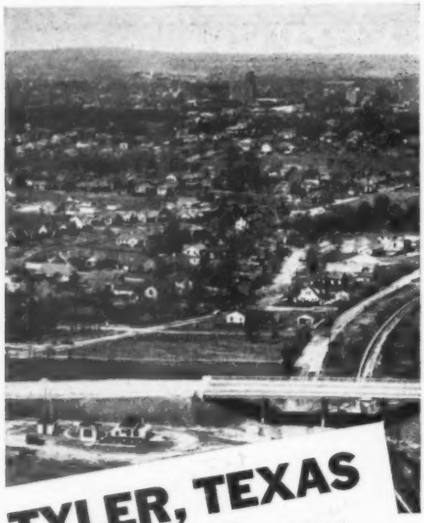
OF PROGRESSIVE WATER WORKS ENGINEERING

HAVE YOU SEEN the "inside story" of the Type E Flow Controller for Filter Effluent? — Address

BUILDERS-PROVIDENCE, INC.

(Division of Builders Iron Foundry)

PROVIDENCE RHODE ISLAND



TYLER, TEXAS
City and Industry— 100% Layne

NUMEROUS are the cities and towns where municipal and industrial water wells and pumps are 100% Layne. The progressive and thriving city of Tyler, Texas, is an example. The first ground water development in that area was installed by Layne in 1934. Since then all municipal and industrial well water supply and turbine pump systems have been Layne.

In meeting defense and armament project emergencies, Layne Companies have broken all records, both in the number of wells and pumps installed and in the quantity of water produced, in any like period of time. In addition to such added activity, Layne Companies have continued their service to municipal and industrial non-defense projects without appreciable delay.

Layne is unquestionably the largest and most widely experienced ground water developing organization in the Nation. Their methods have proven most successful and the number of their completed projects exceeds that of any other organization ten times and more.

Layne has the men, machinery and experience necessary to handle water development contracts of any size. Their Engineers are ready to cooperate on your plans. If you need more water, write or wire.

LAYNE & BOWLER, INC.
Memphis, Tenn.

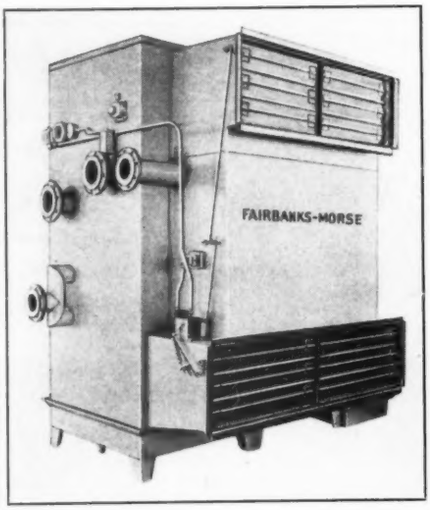
LAYNE
PUMPS & WELL WATER SYSTEMS

AFFILIATED COMPANIES

Layne-Arkansas Co.	Stuttgart, Ark.
Layne-Atlantic Co.	Norfolk, Va.
Layne-Bowler New England Corp.	Boston, Mass.
Layne-Central Co.	Memphis, Tenn.
Layne-Northern Co.	Mishawaka, Ind.
Layne-Louisiana Co.	Lake Charles, La.
Layne-New York Co.	New Cork City.
Layne-Northwest Co.	Milwaukee, Wis.
Layne-Ohio Co.	Columbus, Ohio.
Layne-Texas Co.	Houston, Texas.
Layne-Western Co.	Kansas City, Mo.
Layne-Western Co. of Minnesota	Minneapolis, Minn.
International Water Supply	London, Ontario, Can.

most economical so far developed, consists essentially of a coil through which the jacket water is passed, nozzles to spray water on the coil and a blower to force air past the coils. In operation, the hot jacket water enters the cooling coil at the top of the cooler, water from the reservoir at bottom of unit is sprayed over the coil from one end and air is blown in from the other end.

The cooling process is the result of the water spray over the outside coil in the opposite direction to the flow of induced air. The heat of the jacket water is absorbed by the air through direct transfer and by evaporation of water on the coil surface. After being cooled, the jacket water is then returned to the engine. The spray water is constantly recirculated so that the active amount consumed is only about two pounds per 1,000 B.t.u. of engine heat absorbed.

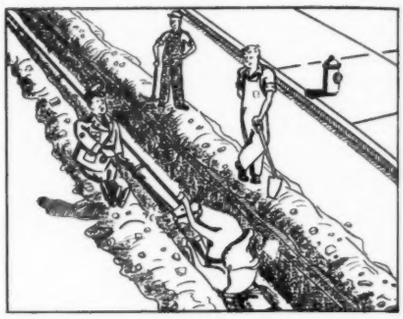


Units are available which cool the engine lubricating oil in a separate coil within the same cooler as the jacket water. This simplifies piping and saves space. Three types of coolers are built by the manufacturer, viz: completely automatic, semi-automatic and manual.

The cooler is designed primarily for indoor operation although units for outdoor installation may be secured with cooling coils of the finned type to permit air-cooled operation throughout the winter season. The finned type coolers may also be used indoors in winter season to heat occupied spaces through branch lines of the air discharge duct.

Jacket water cooling of Diesel and gas engines is only one use to which these coolers are adapted, according to the manufacturer. They are also being used for general water cooling in chemical plants, oil refineries, steel plants, paper manufacturing, etc.; for refrigerant condensing in air conditioning, milk plants, ice plants, breweries, packing plants; and for miscellaneous cooling such as transformer cooling and the like.

A new bulletin, FECD-2, describing the coolers, may be had by writing Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.



HELPS AVOID SITUATIONS LIKE THIS . . .

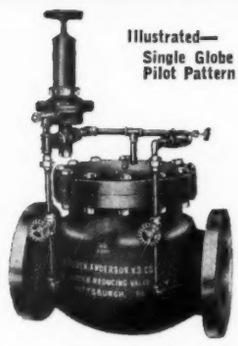
Traffic tie-ups don't help good will for the engineer in charge • Tegul-MINERALEAD as your jointing compound brings quick sealing of that initial leakage, so trenches can be backfilled at once and traffic hazards reduced • Tegul-MINERALEAD makes tight, flexible joints with far more than usual resistance to thermal and mechanical shock • The 10-lb. *ingot* form isn't bothered by rain, snow or flood and is easily handled, shipped and stored • Tegul-MINERALEAD cuts jointing costs, both initial and upkeep • For more information, write The ATLAS MINERAL Products Company of Pa., Mertztown, Pennsylvania.

Tegul- MINERALEAD

for Jointing **BELL AND SPIGOT MAIN**

See page 30 of our new 96-page catalog for information on this

WATER PRESSURE REDUCING VALVE



Illustrated—
Single Globe
Pilot Pattern

These valves maintain a constant downstream pressure against any higher upstream head;

—operate without any shock or jar, owing to inherent air and water cushioning;

—and they do not hunt in positioning themselves for the necessary rate of flow, owing to the sensitive pilot valve control —thus *wear* on the renewable cups and seat washer is ***minimized.***

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Rubber Tread Belt Conveyor Idler by Link-Belt

• A short time ago Link-Belt Co. announced a rubber tread return run idler for belt conveyors. Now comes the announcement of a new troughing type impact belt conveyor idler with live rubber treads for absorbing shock and prolonging the life of both belt and idlers.

The cushioning effect of the rubber-to-rubber contact between belt and idler precludes cutting, bruising and scuffing of the belt; and protects bearings and framework for shock.

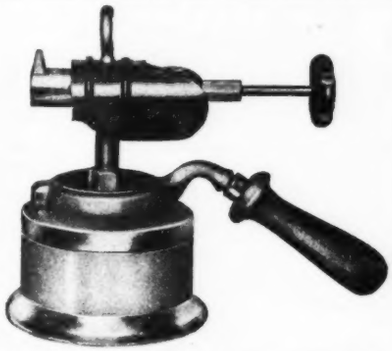
Molded rubber-tread rolls 6 in. in diameter are firmly secured to a Friction Fighter roller-bearing-equipped tube by set-screws through malleable iron spacers which clamp over reinforced rubber hubs. The new idlers available for belt widths of 14 to 48 inches, are further described in Folder No. 1793, which may be had by writing Link-Belt Co., 307 N. Michigan Ave., Chicago.

Safety Gasoline Blow Torch

• The National Safety Blow Torch uses no pump and thus eliminates the most frequent cause of trouble and accidents with blow torches.

Pressure is originally obtained by the expansion and vaporization of the gasoline in the supply tank through heat transmitted to it via a metal stay bolt welded to the top and bottom of the tank. Once lighted, it holds its pressure by continually transmitting a part of the heat from the burner until the entire gasoline supply is exhausted.

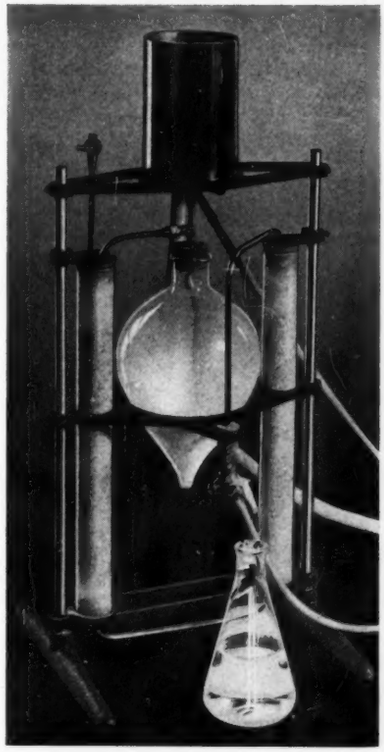
Having no oxygen introduced into the tank it keeps the fuel line free of



oxidation and in fact is non-explosive in that there is no air in the supply tank with the fuel. This absence of a pump also allows the torch to be used sidewise, upside down or in any other position, and thus lends itself to positions of use not possible with tank type torches. Soldering iron and flame

(Continued next page)

Announcing **THE NEW**



ENSLOW STABILITY INDICATOR

Completely redesigned to embody improvements suggested and developed by practical water works men under actual plant operating conditions.

Conceived by L. H. Enslow, this apparatus provides a continuous index of corrosivity or stability of water, with nothing more involved than alkalinity filtrations and **no** complicated calculations.

In operators' opinions **"an invaluable aid"** in the control of stabilization and anti-corrosion treatment.

Write for descriptive literature.

PHIPPS & BIRD, INC.
RICHMOND, VA.

"SOUTHERN CENTER FOR LABORATORY APPARATUS AND CHEMICALS"

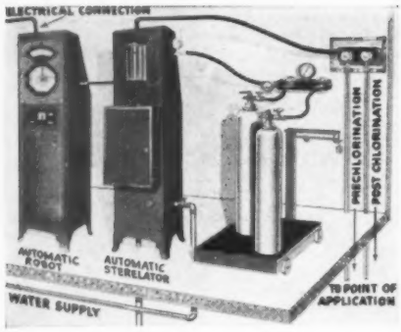
TYPE C SINGLE LID
METER BOX COVERS

These covers are made right to give a lifetime of satisfactory service to the water utility and real convenience to the meter reader. A variety of sizes, heights and weights for all conditions.

All Ford Meter Box Covers are equipped with the Lifter Worm Lock with Forged Everdur Bolt.

Ask for a catalog listing Type C Covers and all of our other products.

FORD METER BOX CO.,
SETTING AND TESTING EQUIPMENT FOR WATER METERS
WABASH, INDIANA



SterElatorS by Everson

The new EVERSON Electric Robot Controlled Automatic Proportioning SterElator is the last word in waterworks and sewage plant chlorinating equipment.

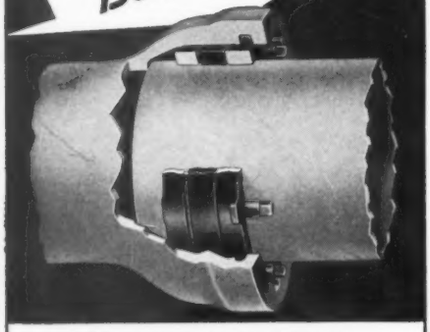
1. Automatically proportions gas flow to water flow, mixes and feeds chlorine in solution and indicates gas flow.
2. Robot indicates and records the water flow and totalizes gas flow.
3. Operates under substantial vacuum (2 inches of mercury).
4. Completely protected automatic safety devices . . . automatic shut-off, automatic siphon breaks, etc.

Write for Bulletin describing the complete line of manually controlled, semi-automatic and Robot controlled EVERSON SterElatorS . . . each a better unit for its type of work.

EVERSON MFG. CO.

233 W. Huron St. Chicago, Ill.

JOIN CIP LINES WITH DRESSER Bellmasters



Cutaway view of 6" CIP Bellmaster Joint. Bell end of pipe is of simple design to accommodate the Joint.

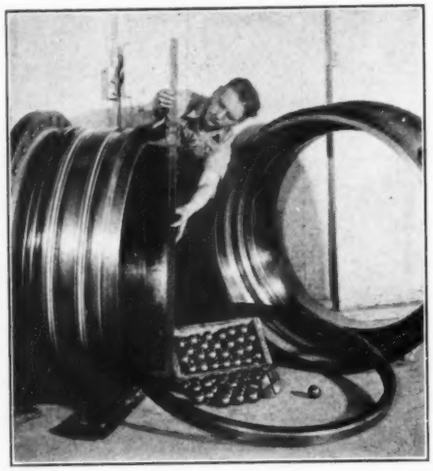
● When the going really gets tough—that's when you'll fully appreciate the advantages of the new Dresser Bellmaster Joint, Style 85, for joining CIP lines. Comes *completely* assembled, can be installed in from 2 to 5 minutes by an ordinary workman using only a wrench. Bellmaster fits inside bell. Stays permanently tight, offers complete protection against corrosion. Resilient gasket protects against pipe movement, expansion and contraction. Write today for a free sample Bellmaster!

Dresser Manufacturing Company
BRADFORD, PA.

spreader for quick assembly onto the burner are also available.

An attractively illustrated bulletin, completely describing this interesting safety torch of 1941 is available by writing Davis & Murphy, 500 N. Dearborn St., Chicago, Ill.

Giant Swing Joint Turns Easily on Ball Bearings



● The Chicksan Tool Co. of Brea, California, have supplied us with the above picture of what is thought to be the largest ball-bearing swing joint ever built.

This 36-inch joint, built on special order for a Federal projcet, weighs 3,087 pounds and turns on 128 stainless steel balls arranged in two rows and turning in flame-hardened races. The balls are of 2-inch diameter. Under a thrust load of 6,500 pounds, no variation in face-to-face dimensions was detected. Built of steel, this joint is sealed both internally and externally, permitting its use on the surface or in submerged service. The easy turning, effected by the design used in all Chicksan Swing Joints, is illustrated by the fact that this 36-inch joint can be turned by hand by one man.

Fur further details pertaining to Chicksan Swing Joints, write Chicksan Tool Co., Brea, California.

Handy Bags for Chemicals

● % Proportioneer's % "Handy Bags," originally designed to serve as solution containers for use with solution feeders such as the "Chlor-o-Feeder," appear to have other uses and therefore are called "Handy Bags."

Replacing the heavy and cumbersome crockery solution reservoir, these collapsable bags or buckets, are made of rubber coated canvas. Having a capacity of 5 gallons each may be folded into a small package.

This advantage renders these bags, or buckets, very useful for numerous purposes, including main sterilization or emergency chlorination with a compact and fully portable outfit.

For a descriptive illustrated leaflet write % Proportioneers % Inc., No. 9 Codding Place, Providence, R. I.

THE NATIONAL METHOD
BEFORE CLEANING — AFTER CLEANING

CLOGGED PIPES

Made Good as New

THE NATIONAL METHOD OF WATER MAIN CLEANING makes your old pipe practically as good as new. Every department is subject to loss through the ravages of time upon its distribution system. The cleaning out of this foreign matter inevitably leads to increased pressure and flow, improved health conditions, and lowered operating costs.

Our illustrated Booklet, "The Cleaning of Water Mains," will be sent upon request.

NATIONAL WATER MAIN CLEANING CO.
30 Church Street, New York, N. Y.

BRANCH ADDRESSES
205 West Wacker Drive, Chicago, Ill.
115 Peterboro St., Boston, Mass.
910 William Oliver Bldg., Atlanta, Ga.
7103 Dale Ave., St. Louis, Missouri
208 E. Forsyth St., Jacksonville, Fla.
3812 Castellar St., Omaha, Nebraska
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Canada

PITTSBURGH-DES MOINES

Steel Gasholders

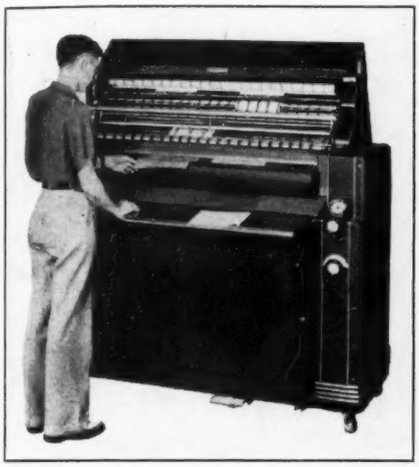
Spherical or bullet types for efficient storage of digester gas under pressure in sewage treatment plants. Any size—any metal—designed to meet your specific requirements. An experienced P-DM engineer will gladly consult with you, without obligation.

PITTSBURGH - DES MOINES STEEL COMPANY
Pittsburgh, Pa. . . . 3418 Neville Island
Des Moines, Ia. . . . . 919 Tuttle Street

Bruning's New High-Speed Developer

• A new BW Developing Machine that answers today's needs for greater print production has just been announced by Charles Bruning Co. of New York City.

Known as the Bruning No. 159 Volumatic Developer, the machine is designed to be used with the Bruning Model "75" BW Printer. Using this new combination, one operator performs the entire printing and developing operation with ease and speed.



In operating the No. 159 Volumatic Sheet Developer, the sensitized paper and tracings are fed into the machine at the front, where they are immediately exposed in the printer section. A vacuum separator roll at the discharge point of the printer separates the tracings from the exposed prints, allowing the prints to pass automatically to the developing and drying sections. The tracing is returned to the operator, while the completely developed print is delivered flat and dry at the rear of the machine.

The No. 159 Volumatic Developer consists of a separator roll, water roll, and a series of bands which carry the developed prints through the drying section. The application of the positive vacuum separator principle in the No. 159 Volumatic Developer is said to be entirely new. The developing section is driven by the printer, and is synchronized to operate at exactly the same printing speeds. The "75" Printer has a speed range of 0 to 25 feet per minute.

For additional information, write the maker—the Charles Bruning Co., 100 Reade St., New York City.

THE *Bailey Synchro-Meter* GIVES YOU *Flexibility* IN METERING APPLICATIONS

• This meter panel includes both direct mechanically operated Fluid Meters and Bailey Synchro-Meters, which are electrically operated by remote transmitters.

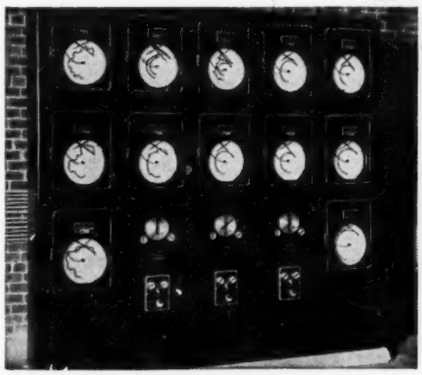
Wherever you have need for a central meter panel incorporating both mechanically and electrically operated Fluid Meters, it is possible to maintain uniformity and neatness by employing this system of transmitting meter and recorder readings.

Readings of flow, pressure, temperature, liquid level and other factors are accurately and quickly transmitted from out-of-the-way places to the receiving indicator, recorder or integrator by the Bailey Synchro-Meter.

This electrical mechanism which is completely described and illustrated in Bulletin No. 194-A, can also be used to eliminate the necessity of running high pressure piping up to meter and control panels.

Write for your copy of this new Bulletin.

MU-17



BAILEY METER • COMPANY •

1072 Ivanhoe Road, Cleveland, Ohio

BAILEY METER COMPANY LTD., MONTREAL

HYDRO-TITE

ONE POUND does the work of four pounds of lead. Much easier to use than lead and requires no caulking.

HYDRO-TITE joints are strong, very flexible and tight.

Write for our free trial offer.

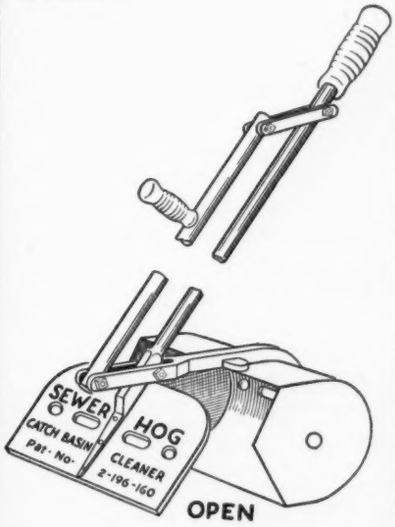
HYDRAULIC DEVELOPMENT CORPORATION

MAIN SALES OFFICE - 50 CHURCH STREET, NEW YORK
GENERAL OFFICES AND WORKS - WEST MEDFORD STATION
BOSTON, MASS.

OVER 25 YEARS WITHOUT A FAILURE

"Sewer Hog"

Turbine's New Patented Catch Basin Cleaner eliminates old fashion Catch Basin Spoons.



Simple, inexpensive; pays for itself every time used.

TURBINE SEWER MACH. CO.
5210 W. State St., Milwaukee
276 Lafayette St. New York, N. Y.

Complete Sewer Cleaning Equipment

Before you clean your sewers, don't fail to investigate our equipment. We supply a complete line of sewer cleaning apparatus—machines, sewer rods, cleaning tools. Machines may be purchased or leased.

Sewer rods and hand tools sent on free trial.

Manufacturing Sewer Cleaning Equipment Since 1901

Write for Catalog

W. H. STEWART

Box 761 Syracuse, N. Y. — Box 591 Jacksonville, Fla.

EDSON'S NEW HAND PUMP

Smallest Diaphragm Pump Made, 2" Suction Open Discharge. Capacity 1400 G.P.H. Weight 50 lbs.

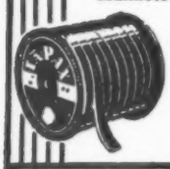
THE EDSON CORP'N
49 "D" Street
So. Boston, Mass.

NEW YORK: 142 Ashland Pl., Brooklyn
CHICAGO: 1061 Peoples Gas Building

Catalog "T" Gives Full Data, Also Edson Hand and Power Pumps, Suction Hose and Pump Accessories

TAPAX

The ORIGINAL *and* FINEST....



Manhole Cushion U. S. Pat. No. 2,050,050 offers you the simplest solution for noisy, rattling covers. Easy to install. Lasting — Economical.

Write for story of Tapax and Trial Offer.

TAPAX MFG. CO., INC.
MAMARONECK NEW YORK

Wanted for Duty with the United States Government at the Panama Canal: Sanitary Engineer (Junior), salary $208.33 month. Must be graduate recognized college with degree in Sanitary Engineering with two years practical experience in the field. Will be assigned to duty in water purification plant as assistant to perform water analyses, bacteriological analyses and make miscroscopic examinations of water; to prepare drawings in connection with alteration of plant facilities; to assist in chemical, physical and other analyses of testing laboratory. Applicants must be young men, American citizens, physically sound. Free steamship transportation from port of embarkation, wages beginning sailing date. For particulars write "Chief of Office, The Panama Canal, Washington, D. C.", giving brief statement of training and experience.

WITH THE MANUFACTURERS

More Chain Belt Promotions

● Chain Belt Co., Milwaukee, has announced the appointment of A. W. Thomas as sales manager of the construction machinery division, D. A. Kalton as assistant sales manager and A. J. Frank as assistant to the manager of the division. All have been connected with the company for many years and have had extensive experience in the construction machinery field.

Mr. Thomas (Purdue, 1925) began his business career in the Illinois and Indiana state highway departments, where he had considerable experience in highway work. He joined the Chain Belt organization in 1927 and worked up to become assistant to the chief engineer. More recently he joined the field sales staff and successively became district manager and assistant to the sales manager.

Mr. Kalton graduated from Marquette University's college of business administration in 1932. Immediately after graduation he entered the employ of Chain Belt.

Mr. Frank (Yale, 1933) became associated with Chain Belt in 1934.

Recently the company also announced the appointment of G. K. Viall as head of the newly organized division of research and development, which embraces all divisions of the company's business.

The construction machinery division of Chain Belt Co. manufactures the well-known Rex line of concrete mixers, road pavers, mortar and plaster mixers, Moto-Mixers, water pumps, and the famed Rex Pumpcrete.

O'Brien Made J-M Vice-President

● The election of John A. O'Brien to the post of vice-president of Johns-Manville Sales Corporation has been announced by J-M's president, Lewis H. Brown.

Mr. O'Brien is a member of the J-M Quarter Century Club, having begun his career with the company in 1915. He will continue his duties as general sales manager of the power products and industrial department, a post he has held since 1938.

W. W. Lockwood New Taylor Advertising Manager

● Wallace W. Lockwood has been appointed advertising manager of the Taylor Instrument Companies, Rochester, N. Y., to replace Elmer E. Way, who has resigned.

A graduate of Auburn High School and Syracuse University, Mr. Lockwood joined the Taylor advertising department in 1932 and was made assistant advertising manager in 1939.

GASKET AND FORM
The Perfected Method for Making SEWER PIPE JOINTS OF CEMENT

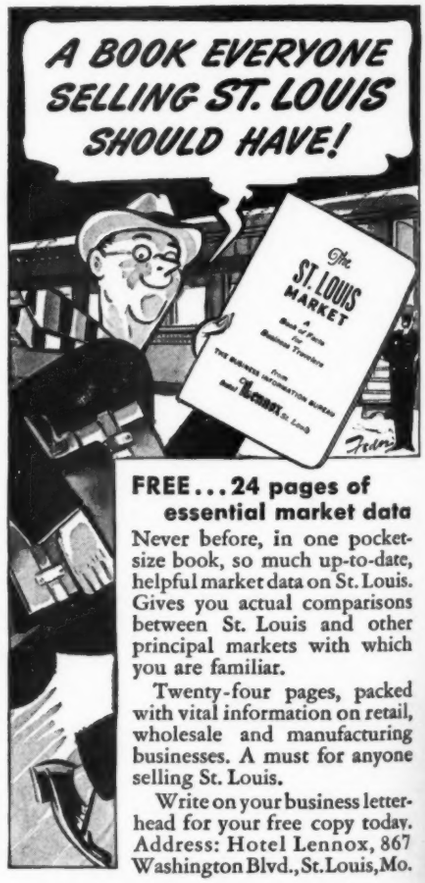
- **No jute used—gasket centers spigot.**
- **Definite space in each joint for cement.**
- **Form confines cement-grout to lower portion of joint.**
- **Particularly advantageous in water-bearing trenches.**
- **Infiltration minimized.**

L. A. WESTON **Adams, Mass.**

Advertising Manager

now and for past 15 years manager of advertising department of $13,000,000 manufacturer of machinery and tools, is available for similar position preferably in New York City or nearby locality. Has complete charge of trade paper advertising preparation and production of catalogues, booklets, sales material, etc. Address Box 441, Water Works and Sewerage, 330 So. Wells St., Chicago, Ill.

A BOOK EVERYONE SELLING ST. LOUIS SHOULD HAVE!



FREE...24 pages of essential market data

Never before, in one pocket-size book, so much up-to-date, helpful market data on St. Louis. Gives you actual comparisons between St. Louis and other principal markets with which you are familiar.

Twenty-four pages, packed with vital information on retail, wholesale and manufacturing businesses. A must for anyone selling St. Louis.

Write on your business letterhead for your free copy today. Address: Hotel Lennox, 867 Washington Blvd., St. Louis, Mo.

P.S. You'll really enjoy a stop at Hotel Lennox. Nationally famous for friendly, efficient hospitality, good food and real comfort. And downtown St. Louis is right at your doorstep!

Over 50% of rooms, $3.50 or less, single; $5.00 or less, double.

hotel Lennox *St. Louis*

The Langelier

MOTORIZED WATER HARDNESS APPARATUS

for the rapid and convenient determination of CaH and MgH, separately or combined. Write for details.

Chemlab Specialties Co.
52 Alvarado Road
Berkeley, California

PHOENIX
DISC WATER METERS

FEATURING
SPIRAL GEARS
(A Phoenix Patent)

Have an Excellent Record of Dependable — Accurate Service *Since 1914.*

Repair Parts for Water Meters
We furnish Parts for
UNION KING METERS
Send inquiries for prices.

PHOENIX METER CORP.
PRINCE BAY, S. I. NEW YORK, N. Y.

CAST IRON PIPE

The Standard Material

for

Underground Mains

THE CAST IRON PIPE RESEARCH ASSOCIATION

Thomas F. Wolfe, Research Engineer
1015 Peoples Gas Bldg. Chicago, Ill.

The Meter-Master

RATE RECORDER FOR WATER METERS

Send For Literature

F. S. BRAINARD & CO.
146 Pearl Street, Hartford, Conn.

George L. Geuss Joins Pittsburgh-National

● Announcement has been made by Charles F. Thomas, district manager of Pittsburgh Equitable Meter Co. at Buffalo, N. Y., that George L. Geuss has been appointed to the sales staff, working in the New York state territory in the interests of the Pittsburgh-National line of water meters. He succeeds W. L. Herron, who resigned.

Mr. Geuss received his early training from his father, who was a master plumber and water engineer in St. Louis. He has had considerable sales experience and for a time conducted his own business in the metropolitan New York area.

Roller-Smith Appoints Minneapolis Agents

● The Roller-Smith Co., Bethlehem, Pa., announces the appointment of the Electrical Jobber Equipment Co., 501 Fourth Ave., South Minneapolis, Minn., as its sales agent for the states of Minnesota, North Dakota, South Dakota and that part of Wisconsin west of a line drawn between La Crosse and Ashland.

The Electrical Jobber Equipment Co. will handle the entire Roller-Smith line of products which include switchgear, oil, and air circuit breakers, and electrical instruments.

A Price Reduction (Believe it or Not)

● In these days, when a manufacturer comes-out with a notice of price reduction most of us will agree—*that's news.*

In any event we have in front of us a notice of "Price Reduction," effective immediately, from Elastic Stop Nut Corporation of Newark, N. J., producers of these interesting nuts which are proof against jarring loose by vibration and require no lock-washers or lock-nuts.

A price reduction at this time indicates that this company is sailing under no name it can not justify, when the word "Elastic" is used.

Foxboro in New Cincinnati Office

● The Foxboro Co., well known manufacturers of precision instruments for process control and measurement, of Foxboro, Mass., announce the removal of their Cincinnati office into new quarters—suite 607 American Bldg., Walnut St. and Central Parkway.

Mr. Yeastman Anderson is manager of Foxboro's Cincinnati District and office.

ROSS
AUTOMATIC VALVES

Reducing	Combination
Relief	Surge
Altitude	Float
Back Pressure	Differential

ALTITUDE VALVE
for
Control of elevation and heads into and out of tanks, basins and reservoirs.

ROSS VALVE MFG. CO., Inc.
P. O. Box 595 Troy, N. Y.

LEADITE
The Pioneer Self-Caulking Material for C.I. Pipe

. . . has jointed more miles of cast-iron water mains than any other melted Self-caulking material!

THE LEADITE COMPANY
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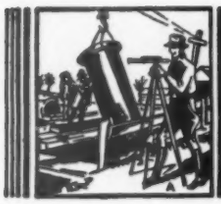

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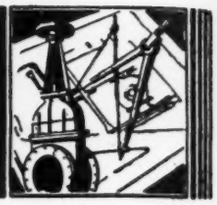

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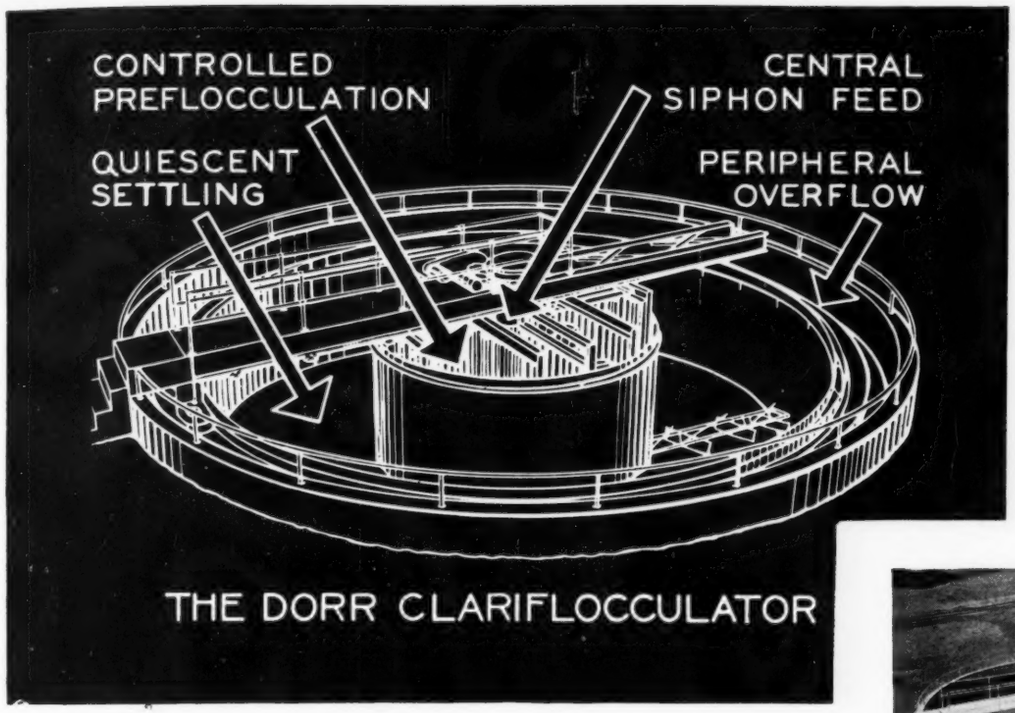

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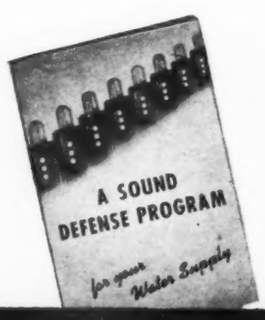

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